

# **NIHAE**

**Report and Recommendations  
On  
Teaching of Biostatistics  
In  
Medical Colleges**

**NATIONAL INSTITUTE OF HEALTH ADMINISTRATION AND EDUCATION**

## FACULTY, 1973

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**Report and Recommendations  
On  
Teaching of Biostatistics  
In  
COMMUNITY MEDICAL COLLEGES  
Medical Colleges**

**Need for Teaching of Statistics to Medical Students  
Review of the Present Position  
Recommendations  
Appendices**

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## **Biostatistics and Medical Education in India**

EDUCATION & TRAINING of the Health Administrator of today and tomorrow, so as to enable him to exercise the leadership role expected of him in a rapidly changing situation, is one of the primary functions of the National Institute of Health Administration & Education. In trying to fulfil this objective, the Institute offers short & long courses of training and organises seminars, conferences and workshops from time to time. Experience has shown, however, that this is not enough to bring about the necessary change in the outlook and approach of the health administrator, in the absence of the desired reform in the basic course of academic training. Towards that end, the Institute has tried to provide a platform for the discussion of problems of education and training of health personnel in general. Early in 1967, a committee with representatives of the Directorate General of Health Services, the Medical Council of India and the All India Institute of Hygiene & Public Health, Calcutta, was convened in this Institute to review the existing training courses in Social & Preventive Medicine and to suggest required reform. The recommendations of that committee, based on replies to an exhaustive questionnaire issued to health administrators, deans and teachers of medical schools, and institutes providing higher training in public health, were discussed at a representative conference of administrators and teachers. The resultant report, suggesting for teaching changes in post-entry training of medical officers, their continuation education, D.P.H. & M.D. (P.S.M) courses, has been submitted to Governments, Universities and the Medical Council of India. This Institute has already started an M.D. Course in Community Health, in tune with the recommendations of the committee, and the Medical Council of India is understood to have adopted most of the recommendations for purpose of the M. D. (P.S.M.) course, under the reviewed nomenclature of M. D. "Community Medicine".

Earlier in 1965, the NIHAE had called a conference on the teaching of social & preventive medicine in medical colleges, which provided valuable leads in many directions. A somewhat similar effort was made in regard to the teaching of social sciences to the medical students.

Health Administrators and Social Scientists working in the field of health were brought together to help them understand and appreciate each others role and needs and to suggest ways for sensitising the administrator to social science disciplines.

An area of great pervasiveness and increasing importance for the health administrator is that of epidemiology of biostatistics. Recognizing that

the medical student is being given an inadequate grounding in biostatistics at the undergraduate level, and being left more or less to his own resources at the post-graduate level, it was felt that the time is opportune to make a general review of the available facilities, the operative curriculum, the duration and methods of teaching etc. of biostatistics to the undergraduate and post-graduate students.

Consequently, the Department of Statistics of the Institute took up the collection of information on the statistical content of medical and health courses through a questionnaire sent to all medical colleges in India. Information on methods of teaching and background of the teachers of statistics in medical colleges was also collected. Yet another aspect of the study was the examination of the statistical content of different courses recommended by Medical Council of India adopted by different Institutions. In the past two decades, a few conferences on medical education in India and abroad examined inter alia the content of courses on biostatistics and made recommendations thereon. The Royal Commission on Medical Education in U.K. examined the subject in 1965-68. A Conference on Teaching of Biostatistics in Health Institutes was held under the auspices of the W.H.O. in 1962. The WHO Expert Committee on Health Statistics considered the subject on two occasions and made recommendations. All this literature was collected and examined. It was also decided to place this material before meeting of teachers of biostatistics from selected medical colleges and other experts in this field and accordingly a two-week seminar was organised in the institute in June 1970 with the assistance of the SEARO/WHO. On the basis of the material collected and the discussions in the seminar, recommendations with regard to the course content in statistics for different medical and health courses and on other related matters were evolved and are incorporated in the present report. In the light of these recommendations the NIHAE will take appropriate follow-up action either on its own or in association with appropriate authorities to help improve the teaching of biostatistics to medical students.

I would like to acknowledge the help generously given by the SEARO/WHO, particularly Dr.R. Padley for his assistance in making available the services of Dr. J.Cervenka as a short-term consultant, and for his own contributions to the seminar, the teachers of social and preventive medicine and of biostatistics from various parts of the country. The department of Statistics of this Institute, under the leadership of Shri H.R. Sharma deserves to be thanked for the painstaking preparatory work and completion of the report on the basis of the seminar proceedings.

This Report is being presented in the hope that its contents will be of some value and interest to educationists and teachers.

## SECTION-1

### Need for Teaching of Statistics to Medical Students

1. The need for statistics in public health courses has long been accepted and over the years the statistical content of these courses has become more elaborate. Inclusion of statistics in the under-graduate courses is comparatively recent, although its need and importance at this level is yet far from being fully appreciated. This is very tersely stated by the Royal Commission on Medical Education (1965-68), and one can do no better than reproduce the following extract from their report.

"The purpose of teaching statistics to medical students is not to produce statisticians, any more than the purpose of teaching bio-chemistry is to produce biochemists; it is to help doctors to think quantitatively at under-graduate level in two main ways. First the subject is an integral part of the logic of scientific method and can be conveniently used to introduce ideas about making and interpreting observations and about experimentation. Secondly, statistics comprises a body of techniques for the measurement and assessment of variation, used widely and increasingly in medical research on diagnostic procedures, effectiveness of treatment, development of new drugs, causative factors in disease, laboratory measurement and many other subjects. Some knowledge of the principles of the statistical approach is now necessary so that doctors can make some judgement for themselves of the validity of the claims for medical advances made in journals and other communications. Instruction in statistics is a necessary part of the process of producing a graduate who can apply a scientific outlook to his future experience".

### Historical Background

2. During the last 25 years or so, much thought has been given to the content and methods of medical education in India and abroad, and a number of committees, conferences and expert panels have looked at different aspects of the subject. In these conferences, reports and discussions, the subject of bio-statistics has been discussed earlier as a part of public health and hygiene and later as a part of preventive and social medicine. The starting point in this respect could be considered as the Bhore Committee Report. This committee, while commenting on the system of medical education in India at the under-graduate level, observed that the emphasis laid on the teaching of preventive medicine and public health in the under-graduate course was quite inadequate and that very little advance had been made even

in other countries. The Committee felt that the subject was taught in such a way as to make the students think that it was of little importance and of less interest. In the opinion of the Committee details about such matters as water supply, sewerage system and vital statistics and their calculation made the course dull and uninteresting. The Committee recommended the establishment in every medical college of a Department of Preventive and Social Medicine so as to give the students an insight into social health problems with contact with home and community life. The emphasis on statistics however, was not so much on matching of the subject as on developing statistics as a part of field practice work. The committee recommended that a part of post-graduate training in preventive and social medicine emphasis among other subjects, should be on statistics. Later a Conference of Teachers of Preventive and Social Medicine in Medical College Education Conference was held in November 1955, in which the teaching of preventive and social medicine was discussed in details. As mentioned earlier, in any discussion on preventive and social medicine, statistics did receive attention. This was followed by a number of high level meetings and conferences on different aspects of Preventive and Social Medicine and the Medical Council of India earlier in 1955-56, adopted the curricula for the under-graduate teaching of Social and Preventive Medicine. As a result of these discussions and deliberations, three important developments took place, namely

- (i) In a large number of medical colleges in India, departments of preventive and social medicine were established.
- (ii) The statistical content of the under-graduate curriculum for preventive and social medicine was spelt out; even though in somewhat general terms.
- (iii) The curriculum for M.D. in preventive and social medicine with a fairly extensive component of statistics, was laid down.

3. In 1965, the National Institute of Health Administration and Education held a Conference on the Teaching of Preventive and Social Medicine in relation to the Health Needs of the Country. This conference took note of the developments since the Bhore Committee Report and observed in particular that in the general process of evolution of our ideas, the old stereotyped teaching of hygiene and public health in the medical curricula had undergone considerable change and that newer concepts had developed in the teaching of preventive medicine in recent years in relation to the social needs of the community. It also emphasized the close link between the teaching of preventive and social medicine and other clinical specialities, thus, bringing into sharp focus the need for a multi-disciplinary approach where statistics would stand as an equal partner with other disciplines. While spelling out the essentials of preventive and social medicine, this conference indicated a real conviction of prevention being really better than cure as the

first essential, the second being understanding of the natural history of disease, and the third sound epidemiology. This conference accepted the curriculum recommended by the Indian Medical Council in 1944 and urged its adoption by all universities. The conference laid emphasis on bio-statistical techniques as an essential tool to be effectively used for clinical teaching.

4. As a part of an exercise for the determination of requirement of higher education in health, this Institute carried out a survey among the public health physicians in the country about the weightage which should be given to different subjects as a part of public health training. It was observed that in order of priority, statistics received a very high rank among the 29 subjects listed therein.

5. In 1966, a Seminar was sponsored by USAID in Trivandrum on teaching of social and preventive medicine. Teaching of Bio-Statistics was one of the topics discussed in that Seminar. The general conclusion as a result of the discussions was that the importance of this subject in the medical curriculum was not being sufficiently recognised by the profession in general and by the students in particular. It was also felt that the insufficient mathematical background of medical student and the absence of an examination in this subject were in parts responsible for lack of serious interest on the part of the students. Some of the teachers were of the view that more emphasis was laid on computational rather than the philosophical aspects of the subject. Non-availability of standard text books suited to Indian conditions was also considered to be a factor militating against the subject becoming popular. The integration of teaching of bio-statistics with other subjects was emphasized.

#### **Recommendations on the subject from time to time**

6. The importance of statistics as a part of medical education, medical and health practices and medical research has been slowly but increasingly realised and recognised by the health authorities in different countries as well as in India. Questions as to what should be taught, how and at what stages of the medical and health curricula etc. have been engaging the attention of the concerned authorities and agencies in different countries. The subject has been discussed under the auspices of the WHO also. Pertinent directions and recommendations from selected sources are summarised from literature on the subject in Appendix-I of this report. For detailed information, reference may be made to the relevant documents in original.

7. The U.K. Royal Commission Report on Medical Education 1965-68 has spelt out the purpose of teaching statistics to medical students, emphasises the dual concept of statistics i.e. scientific methods and body of techniques, indicates the length and content of teaching to be given, the place of statistics in the medical faculty of a medical college and lists the

topics which should be taught. If the total course content for the medical students is divided in 81 units, the commission has recommended for statistics one unit of compulsory teaching and 2.25 units of elective teaching. In addition, another 17 units of optional subjects could be appropriately allocated in part or whole to the subjects related to statistics such as mathematics, computer science, community health etc.

8. The teaching of statistics in medical and health courses was discussed under the auspices of the W.H.O. by the Expert Committee on Medical Education, by individual experts or through conferences and seminars held from time to time. The relevant recommendations are given in W.H.O. Technical Report series No. 216 & 239. The former incorporates recommended requirements for the students of public health and emphasises the aim and content of health statistics in public health courses.

9. As a part of the professional education recommendations of the Medical Council of India adopted in November 1964 and June 1965, the Council indicated the statistical content of the medical courses. The recommendations of the Council were partly general and partly specific. The Institutes and medical colleges were expected to lay down the details of the course content within the framework of the recommendations of the Council. The recommendations of the Council are spelt out in three broad headings, namely, statistics as a part of under-graduate medical curriculum at the pre-clinical stage in broad lines, biostatistics and vital statistics as part of social and preventive medicine to be taught during the pre-clinical period of MBBS courses, topics of statistics to be taught during clinical period as a part of or in collaboration with epidemiology, public health administration, nutrition etc. The details thereof are given in Appendix-1. In the 1965 Annual Conference of the Indian Association for the Advancement of Medical Education on Post-graduate Medical Education a number of papers were presented and recommendations on different aspects of medical education were made. The conference circulated a detailed paper on biostatistics as a part of medical curriculum; this paper inter-alia discussed the objectives of teaching of biostatistics and statistical methods to be studied to achieve the said objectives. Details thereof may be seen in Appendix-1

## SECTION-2

### A Review of the Present Position

10. In Section I an attempt has been made to bring out the need for reinforcing the teaching of biostatistics as a part of medical education at different levels. The developments over time, particularly in India are recounted in some detail and the recommendations on the subject made from time to time have been recapitulated. It is clear that in most cases the recommendations are general in nature and the specific details are left to the medical colleges. This has resulted in wide variations in content, and methods of teaching of statistics. An evaluative study of this process will no doubt be very useful to give leads for further action and to avoid pitfalls but such retrospective study will be handicapped for want of adequate details. Therefore, an attempt is made here to evaluate the present position in India as it obtains in 1970.

11. The Medical Council of India made recommendations primarily in a framework in which the universities could decide the course contents; the universities in turn, spelt out a few more details and left it to the medical colleges to work out the details. Thus since the statistical content of medical courses in India has been determined at three levels; it would be worthwhile examining the three stages separately.

### *Methods of Assessment*

12. For an assessment of the present situation a three way approach was followed. The Medical Council regulations in regard to the undergraduate and post-graduate courses were first obtained and treated as a benchmark. The course content prescribed by the universities was obtained from the university calenders. Information was not available for all the universities of India. Only data in respect of 19 universities could be collected from published reports. For other 32 universities no data could be collected.

13. For collection of information from medical colleges a questionnaire (see Appendix II) was prepared and sent to 92 medical colleges in India. The information sought included the name of the Institution, the department responsible for teaching of bio-statistics, the curriculum contents including the topics covered, the number of lectures, the number of practicals and the year of M.B.B.S. course during which the subject is taught, the methods of teaching used such as didactic lectures, seminars, symposia etc. The Institute also collected information on members of the faculty who took part in teaching, their professional qualifications, experiences, pay scales etc. and research

work done by them. Replies were received from sixty nine out of 92 medical colleges. Information on the content and methods of teaching statistics to post-graduate students was collected from three sources. The syllabi prescribed for the M.D. (P.S.M.) and M.D. (CH) were taken from the selected medical colleges/Institutions. The syllabi prescribed for the other public health courses were obtained from the respective Institutes. No data were readily available on what was being taught to the post-graduate medical students of other specialities. In order to have an idea about the statistical needs of these students, a review of 350 dissertations selected from the library of AIIMS and ICMR was undertaken. The material collected from sources was supplemented by the personal experience and observations of the teachers. The material collected from these sources was further supplemented by the personal experience and observations of the teachers of biostatistics who attended the seminar held later in June, 1970.

### *Teaching of Statistics at the Under-Graduate Level*

14. The prescribed course was generally within the framework of the recommendations of the Medical Council of India in case of universities which introduced statistics after 1965. For other Universities the detail varied widely. Thus information is available from the Universities of Andhra, Gauhati, Gujarat, Baroda, APS Vishvavidayala, Rewa (M.P.), Bombay, Marathwada, Berhampur, Punjabi, Rajasthan, Agra, Lucknow, Allahabad, Banaras, Calcutta, Delhi and the All India Institute of Medical Sciences. Some of the Universities did not spell out the course content even broadly and left it to the medical colleges concerned. In appendix III available information for the universities and colleges is given in detail and side by side so that comparison could be made. It is observed that the course content prescribed by the Universities is generally very inadequate. Out of the 69 medical colleges biostatistics is being taught in 61, and in the remaining colleges it has not yet been introduced. It is observed from the course-content that there is wide variation among the topics taught in different colleges.

### *Broad Course Content :*

15. Varying combination of the following 16 topics are generally observed.
- (1) Introduction—Aim and scope—Definition of statistical methods and scientific methods.
  - (2) Collection of Data—Basic ideas of “selection” (Bias) in different situations.
  - (3) Presentation of Data—Need for condensation—Qualitative and

Quantitative/Data-Scales of Measurement—Frequency Distribution Histograms—Contingency table—Graphs and Charts.

- (4) Measures of Central Tendency—measures of dispersion.
- (5) Normal Distribution—Properties—Place in statistical work.
- (6) Elementary concepts of probability.
- (7) Tests of significance—Basic Logic—common Tests  $t, x^2$ .
- (8) Simple correlation & regression concepts.
- (9) Concepts of sampling—calculation of standard errors.
- (10) Introduction of the role of experimental designs in specific situations.
- (11) Need for diagnostic tools in community health,
- (12) Statistical study of population—“Composition” and “Change in composition”. Census and Registration of Vital Events System in India.
- (13) Measurements, Definition of Health—Concepts and Drawbacks.
- (14) Measurement of Mortality—Indices—Standardisation—International Classification of causes of death.
- (15) Measurement of Morbidity—Incidence & prevalence—Sources of Morbidity data.
- (16) Demography—Determinants of Population Growth—Fertility Indices-Birth and Death Rates—Infant Mortality Rate.

#### *Teaching Method*

16. It is observed that generally two principal methods of teaching are employed in these institutions for giving instructions in bio-statistics i.e., didactic lectures and practical exercises. In a few colleges besides these conventional methods seminar type discussions and problem oriented field projects are also taken up. The extent to which methods are used is indicated below :

<i>Method</i>	<i>Number of medical colleges in which employed.</i>
(1) Didactic lectures	61
(2) Practical Exercises in class-room	41

(3) Seminars	3
(4) Problems oriented, practical exercises in the field.	10

17. The time allotted for bio-statistics varies considerably from one medical college to the other. In some colleges it is less than 5 lectures and at the other extreme is a maximum of 56 lectures.

18. On an average 19 hours of teaching is done in bio-statistics during the entire course of 5 years; an average of 14 hours are devoted to lectures and 5 hours to the practical work. Needless to say that in statistics the practical work must form an important part of the total instruction to drive home the advantage of didactic teaching. The extent of practical work as related to didactic lectures as revealed by the following table relating to 56 medical colleges for which information is available is very interesting.

TABLE

Distribution of Medical Colleges according to the Numbers of didactic lecture hours and hours of practical work.

Sessions for lectures	Numbers of Sessions (hours) for practical work						Total
	0	1-5	6-10	11-15	16-20	21-25	
0	—	—	—	—	—	—	—
1-5	1	—	—	—	—	—	1
6-10	5	6	2	2	—	—	15
11-15	8	5	5	1	—	—	19
16-20	1	3	4	—	1	1	10
21-25	2	1	1	1	1	1	7
26-30	—	—	—	—	1	—	1
31-35	—	—	—	—	—	—	—
36-40	—	—	1	—	—	—	1
41-45	—	—	—	—	—	—	—
46-50	—	—	—	—	—	—	—
51-55	1	—	—	—	—	—	1
	18	15	13	4	3	2	55

N. B. :—In one Medical College, the number of didactic lecture hours is 56 and 40 hours allotted for practical work.

19. It may be pointed out that in NIHAE the ratio of lecture hours to practical work is 1 : 2. Also in the Hygiene and Public Health Institute, Calcutta, for the Diploma in Health Statistics Course the ratio of lectureh ours to practical hours is 1 : 2. In Medical Colleges from which reports were received 18 make no provision for practical work at all, though one of them devoted more than 50 hours to lectures. Out of the remaining 38 colleges, three give slightly more time for practicals than for lectures, five divide their time equally between lectures and practicals and in the remaining 30, more time is allotted to lectures than to practicals. Bio-statistics teaching is spread over the five year M.B. B.S. course.

#### *Teaching of Statistics at the Post-graduate level*

20. Information on the statistical content of post-graduate courses like M.D. (P.S.M.), D.P.H., D.G.O., Diploma in Health Education etc. was collected on a selective basis, partly due to the shortage of time and partly due to the fact that the statistical content of these courses is quite elaborate, well established and more or less uniform. In Appendix-IV to this report the details of the following syllabi are given :

- (1) M.D. (Community Health); this course is given by the university of Delhi and is conducted by the National Institute of Health Administration and Education, New Delhi. It is two years course with a dissertation. The course has a very detailed and advanced statistical content and includes modern topics like Health Economics, Econometrics, Operations Research, Research Methodology etc.
- (2) M.D. (P.S.M.) : By way of illustration the syllabus prescribed by the AIIMS, New Delhi is given in the appendix IV. It lays more emphasis on statistics in clinical medicine than in the M.D. (C.H.).
- (3) D.P.H. : The statistical content of D.P.H. courses is more varied. Therefore the syllabi for D.P.H. of the Universities of Bombay, Andhra, Rajasthan, Calcutta are given in the appendix.

21. In these courses there is more emphasis on vital statistics and vital statistics rates and elementary statistical methods. Generally more advanced topics are not included.

*Other Diplomas* : Syllabi for some of the diploma courses like DCH (Andhra University), D.H.A. (Delhi University), Diploma in Dietetics, Diploma in Nutrition, Diploma in H.E. all at the All India Institute of Hygiene and Public Health include items on statistics which are particularly useful for the subject matter of the Diploma.

*A review of 350 M.D., M.S. Dissertations*

22. In medical services, statistical methods have an important place as research tools. However, while postgraduate course syllabi in public health and preventive and social medicine, require a knowledge of advanced statistical methods, in other disciplines, there is by and large no regular and systematic instruction in statistics. The use of statistics is essential all the same for the theses or dissertations required for postgraduate degrees. Before deciding upon the level of statistical training and the way in which it should be given, it is necessary to assess their needs in this regard.

23. In the absence, however, of any proper documentation on the subject, an indirect method was followed to get the factual information. About 350 dissertations submitted by the students of different specialities in fulfilment of requirements for M.D., M.S., Ph. D. are available with the All India Institute of Medical Sciences and the Indian Council of Medical Research. These dissertations were reviewed in so far as they contained statistical data and applied statistical methods, with the object of finding the type of data collected and the statistical methods generally used. It is not possible nor necessary to carry out a study in retrospect as to whether the research work done was planned ahead on proper lines, whether the organization of data could have been done better, or whether the use of more sophisticated methods of analysis would have given more sound information and better results. Apart from the research work done for solution of a problem, it is to give the necessary training to the student in research methods. He is expected to apply his knowledge to a specific problem.

24. The information on the type of statistical data collected was tabulated, so that it could be helpful in giving an indication of the type of statistical material thrown up in different specialities of medicine, and the statistical methods which might be more suitable for application in that speciality; also to find out as to which statistical methods can be taught more profitably in combination with a particular speciality.

25. The dissertations included in this study cover 23 specialities. In 58 of the dissertations, no statistical data were presented and no statistical methods employed. The distribution of these dissertations covering the 23 specialities is as follows:—

SI. No.	Speciality No.	No. of Disser- tations	No. of disser- tations with no statistics	No. of dissertation with statistical material
1	2	3	4	5
1.	General Medicine	43	3(7.0)	40
2.	General Surgery	39	11(28.2)	28

1	2	3	4	5
3.	Paediatrics	30	3(10.0)	27
4.	Dermatology & Venereology	24	3(12.5)	21
5.	Pharmacology	23	-(0.0)	23
6.	Ophthalmology	20	9(45.0)	11
7.	Physiology	17	1(5.9)	16
8.	Anaesthesiology	17	5(29.4)	12
9.	Obs. & Gyne.	16	1(6.2)	15
10.	Oto-Rhino-Laryngology	17	-(0.0)	17
11.	Anatomy	15	10(66.6)	5
12.	P.S.M.	13	-(0.0)	13
13.	Orthopaedics	12	6(50.0)	6
14.	Bio-chemistry	11	1(9.1)	10
15.	Microbiology & Bacteriology	12	3(25.0)	9
16.	Radiology	8	-(0.0)	8
17.	Pathology	7	1(14.3)	6
18.	Psychiatry	6	-(0.0)	6
19.	Anthropology	3	-(0.0)	3
20.	Cardiology	2	-(0.0)	2
21.	Hosp. Administration	2	-(0.0)	2
22.	Zoology	1	1(100.0)	—
23.	Dental Surgery	1	1(100.0)	—

26. The above table indicates that use of statistical methods is essential in almost all branches of medicine. It will be observed that in Anatomy, Ophthalmology only 66% and 45% of the dissertations respectively had no statistical content.

27. The dissertations covered in this study were submitted in the course of seven years from 1963 to 1969. It is observed that the use of statistics during the earlier years was rudimentary or non-existent. Towards the later years i.e., from 1966 to 1969, there has been more extensive use of statistics and the application of more advanced methods and sophisticated techniques. In most of the dissertations, there was no evidence of preparation of a protocol and planning of the study in accordance with the principles of scientific method. However, gradually the preparation of a protocol was introduced. It is not clear from a study of the dissertations, whether the students mastered the statistical methods before applying them

or they were assisted by a statistician who actually carried out the statistical analysis for them and the students just incorporated the results.

28. In a large number of studies in general surgery, the statistical analysis relates to the study of associated or post operative clinical and biological conditions. The analysis consists of working out the percentage of cases with specific clinical or bacteriological findings. In a few studies of chronic diseases subjected to surgical treatment, the statistical analysis relates to age and sex specific incidence, duration of those symptoms, specific laboratory findings and their comparison between age groups. However, there is no evidence to show that the statistical procedures and considerations necessary in follow-up studies are observed in such cases. In many of the studies data on a large number of variables are collected but their inter-relations are not estimated. This shows that there is need for better awareness of the more advanced techniques of statistics which are appropriate for medical research.

29. In most of the clinical, biochemical, histological and bacteriological studies, the data were generally analysed to the extent of the percentage frequency in different classes. In some cases the mean and the standard deviation of the biological variables were determined and subjected to the tests of significance for the difference between the means. In all other studies the statistical analysis is of very elementary nature, i.e., it consists of a frequency table with mean, range, standard deviation, percentage frequencies, etc.

30. To the review made above of the present position, it may be added in summary that;

- (i) In most of medical colleges in India the teaching of Biostatistics has been introduced.
- (ii) The universities and the medical colleges have laid down syllabi in the light of the overall recommendations of the Medical Council of India. But by and large the discretion in regard to the statistical content of under-graduate medical courses is that of the teacher concerned.
- (iii) Teaching of statistics is generally the responsibility of the department of PSM where either the professor of preventive and social medicine or one of his assistants is responsible for teaching. In some of the colleges a junior grade statistician is employed for this job. However there are a few notable exceptions where the teacher of statistics is qualified and experienced statistician and enjoys the status of a reader or even professor.

- (iv) Recently a number of new techniques of teaching of statistics and also of other subjects like programmed instruction have been introduced and these can usefully and profitably be adopted for teaching the subject to medical students, while the age old method of didactic lectures continues to be practised.
- (v) There are elaborate statistical topics for the students of public health courses and for the M.D. (PSM.) or M.D. (C.H.) There are no arrangements for teaching biostatistics to the post-graduate students of the other specialities. It is only recently that the AIIMS, instituted a ten-week course for this purpose.
- (vi) Suitable teaching material and textbooks are not available with the result that teaching material and textbooks are not available and the result is that the teaching is thus handicapped for this reason.

	1	2	3	4
(6) Measures of Central tendency mean, median, mode, rates, ratios and proportions		2	2	Paraclinical years.
(7) Measures of dispersion (range, mean deviation, standard deviation, coefficient of variation)		2	2	
Total for paraclinical years		8	9	
(8) Elementary ideas about probability		1	—	
(9) Binomial, Poisson and normal distributions, their properties and applications		2	2	Paraclinical and clinical years.
(10) Elementary ideas of sampling-purposive and random samples, sample size.		1	2	
(11) Sampling variation and elementary ideas about tests of significance standard error.		2	1	
(12) Vital and Health Statistics Definition-sources, channel of registration of births and deaths and their problems		1	As part of field practice	
(13) Census—population estimation		1	—	
(14) International Statistical classification of disease and medical certification of death		1	As a part of field practice.	

	2	3	4	
(15) Important Health indicators and their calculations in terms of				Paraclinical and clinical years.
(a) population indicators	2	2		
(b) Morbidity Indicators				
(c) Mortality Indicators				
(16) Introduction to life Table	1	—		
Total for para-clinical and clinical years	12	7		
Grand Total :	20	16		

#### 34. Post-graduate courses in different branches of medicine

Content	<i>No. of hours</i>	
	<i>Theory</i>	<i>Practical</i>
1		
(1) Introduction, aim and scope of research methodology, preparation of questionnaires and schedules, collection of data	2	—
(2) Processing and presentation of data (tabulation, diagrams, etc.).	2	2
(3) Measures of Central Tendency (Mean, Median, and Mode) and measures of dispersion (range, variance, standard deviation and coefficient of variation).	2	2

	1	2	3
(4) Concepts of correlation, association and regression	1	2	
(5) Elements of probability and probability distributions (Binomial, poisson and normal)		2	2
(6) Elements of sampling—purposive and random (simple, stratified and systematic and sample size).		2	2
(7) Tests of significance (Normal, t, and $X^2$ & F tests) and analysis of variance	3	3	
(8) Design of clinical trials	1	2	
(9) Problems of hospital and field studies	1	2	
(10) Vital and Health Statistics —health indices and their calculation. International classification of diseases	3	3	
(11) Report writing	1	—	
	<hr/>	<hr/>	<hr/>
	20	20	

35. *Additional course content and allotment of time for M.D. (PSM) students :*

(1) Topics	<i>Theory</i>	<i>Practicals</i>
Population census, registration of vital statistical events, their problems	1	—
(2) Measurement of levels of health and their calculations	2	2

(3) Standardisation of rates	1	2
(4) Life table and cohort studies techniques, their uses and importance	1	1
(5) Population trends and Morbidity trends and their problems	1	-
(6) Health surveys as method of community diagnosis and their methodologies.	1	-
(7) Evaluation in Public Health.	1	-
(8) Components of time series	1	1
(9) A review of important field trials with their merits and demerits	1	-
	10	6

### *DPH and Allied Diplomas*

#### *(1) Statistical methodology :*

- (i) Statistics as a tool in research and public health administration, its uses and importance.
- (ii) Collection and compilation of data, including representation and calculation of central tendency and dispersion.
- (iii) Elements of probability and probability distribution, including binomial, poisson and normal
- (iv) Sampling theory and its application in surveys.
- (v) Test of significance, Standard Error.
- (vi) Correlation, association and regression

#### *2. Public Health and Vital Statistics :*

- (i) Vital and health statistics, their definition, sources and types of materials collected. The problem in vital and health statistics data.
- (ii) Health and Vital Statistical indices.

- (iii) Measurement of mortality, morbidity and fertility, their standardisation.
- (iv) Life tables and their uses and importance.

### *3. Demography.*

Principles in the study of population, world population history and trends. Population of India, distribution, composition, trends, population problems.

### *4. Survey and Research Methodology*

Problems in a survey, methods of survey and writing of scientific reports.

Time allowed minimum of :  
40 Hours.

36. The total course content recommended for under-graduate medical course would entail 36 hrs. of teaching, 20 hrs. to theory and 16 hrs. to practical work. About half of the time, i. e. 17 hrs. should be during the preclinical years and about 19 hrs. during the clinical years. It may be mentioned in this connection that the Medical Council of India in their recommendations have provided 21 hrs. of statistical teaching to the undergraduate students. Many medical colleges are, however, already devoting more time to this subject. As increase of about 15 hrs. would certainly put some strain on the allocation of time to other subjects, however, some of the statistical topics can be conveniently and profitably integrated with the teaching of subjects like physiology, pharmacology, bio-chemistry, preventive and social medicine, etc. It is expected that the time saved through such integrated teaching from out of the allocation to various other disciplines would facilitate the necessary adjustment.

37. The question of course content for post-graduate students other than those of Preventive and Social Medicine, is a rather ticklish one. Each speciality has its own requirements of statistical methods and it may not be desirable to load all postgraduates with a uniform type of statistical course. It is, however, felt that about 40 hrs. of teaching of statistics should be provided for post-graduate students. The best time for teaching of biostatistics to post-graduate medical students is considered to be during the first six months of their joining such courses when they are required to pick up the topic for their theses. The teaching of statistics to post-graduates should indeed be given a broader base, so that it comes to be viewed as part of research methodology. As post-graduate students who are now coming for their M. S. and M. D. have varying background and experience in

statistics, it is difficult to work out a uniform course content for all of them. Thus, there will be variation between subjects and among the students of the same subject. A tentative course content of 40 hrs. duration as worked out above, should however meet the requirements of the postgraduate courses generally. It will be observed that many of these topics are common to the under-graduate courses. This seems unavoidable at this stage of development. In course of time, when the students from the under-graduate courses with adequate statistical knowledge come for post-graduate training, they may not find it necessary to cover some of the elementary topics.

38. For students of preventive and social medicine, additional 16 hrs. of teaching are recommended, and a few topics which are of particular use in preventive and social medicine are added as additional course content for M. D., P. S. M. Most of these items are already included in the curriculum content of M. D., P. S. M. in some of the Universities.

39. Topics for inclusion in the Diploma in Public Health are also shown in the above statement, involving 40 hrs. of teaching, including practicals. There are a number of other diplomas and certificates in the field of health, such as, Diploma in Health Education, etc. Each of the diploma has its own special requirements of statistical methods and no attempt is made to list all the possible diplomas and a course content for each of them. However, a statistical content of D. P. H. could form a basis or guide for the purpose.

#### *Orientation of Teachers*

40. A review of the existing situation as already described in the previous sections, has brought out that the teaching of bio-statistics in medical colleges is usually the responsibility of the Professor of Preventive and Social Medicine, his assistants or of a statistician placed in the Department of Preventive and Social Medicine. In respect of the status and academic background of the teacher in a particular situation, he needs all the same to have a thorough knowledge of modern statistical methods and orientation to the application of statistical methods to the field of health and medicine. Generally, the Professors of Preventive and Social Medicine do not have adequate familiarity with modern statistical methods and the statisticians working in their department on the other hand generally junior, fresh from the universities, have little experience in this field. It is, therefore, essential that the orientation of these teachers should be arranged along the following lines :—

- (a) The medical colleges should appoint only qualified statisticians with post-graduate qualification in statistics and orientation in biostatistics, to new posts or positions falling vacant in future.

- (b) For medical colleges where appointment of a wholetime properly qualified statistician is not possible, arrangements should be made with a local college or a university department of statistician to obtain the services of a statistician on a part-time basis. The statistician should also be oriented to bio-statistics.
- (c) For orientation of statisticians already in service, refreshment courses of short duration should be organized by institutions like NIHAE, All India Institute of Medical Sciences, New Delhi, All India Institute of Hygiene and Public Health, Calcutta, etc.
- (d) It is felt that before bio-statistics teaching can be introduced on any appreciable scale, it is necessary to make the teachers of other specialities of medicine acquainted with the need and potentialities of bio-statistics in their respective disciplines. For this purpose teacher orientation courses should be organized locally.

#### *Preparation of Teaching Material*

41. At present, there are hardly any text-books which could be referred to by the teachers of bio-statistics in medical colleges or recommended to the students. Generally, the teachers depend on the available textbooks in the market which borrow examples and exercises from other fields which are not relevant to medicine, do not relate to the background of the students and hence do not enthuse them. It is, therefore, necessary that institutions like All India Institute of Medical Science and NIHAE undertake production of teaching material and development of data bank. For this purpose, it would be necessary to bring together some of the institutions who can contribute in this process.

#### *Follow-up Action :*

42. The National Institute of Health Administration and Education proposes to take urgent action to initiate improvements in the present situation along the lines indicated in the recommendations above. Some of the stages contemplated in this regard are indicated below :—

(1) The Institute proposes to get in touch with the All India Institute of Medical Science, New Delhi, to work out a plan of action for designing the course content for post-graduate students of different medical specialties about the need and potentiality of statistics in their disciplines.

(2) The Institute will organize regional orientation courses for teachers of bio-statistics in different medical colleges. For this purpose, the Institute will run a pilot regional course at New Delhi, in collaboration with other sister organizations.

(3) As a part of production of teaching material and promotion of new techniques of teaching, the Institute will work in collaboration with those organizations which have competence for introduction of modern teaching techniques like programmed instruction, etc.

The Institute would also undertake in collaboration with others the production of teaching material suited to these new techniques.

(4) The Institute will get in touch with the teachers of bio-statistics in different medical colleges and other institutions in the country, from time to time, and would promote the exchange of teaching material and teaching experience among them.

(5) A 'Problem Bank' will be maintained by the library of the Institute where illustrative meterial from the field of health in India will be collected. This material could be drawn upon by the teachers.

(6) This report will be supplied to the medical colleges and the teachers of statistics in medical colleges to ascertain their views to the sequence of actions which could lead to the adoption of these syllabi.

(7) The Institute will get in touch with selected medical colleges and will request them to experiment with new methods of teaching. The Institute will render faculty support in this regard.

## Recommendations of the Royal Commission on Medical Education 1965-68

The purpose of teaching statistics to medical students is not to produce statisticians, any more than the purpose of teaching biochemistry is to produce biochemists; it is to help doctors to think quantitatively.\* The teaching of statistics can contribute to the education of medical undergraduates in two main ways. First, the subject is an integral part of the logic of scientific method and can be conveniently used to introduce ideas about making and interpreting observations and about experimentation. Secondly, statistics comprises a body of techniques for the measurement and assessment of variation, used widely and increasingly in medical research on diagnostic procedures, effectiveness of treatment, development of new drugs, causative factors in disease, laboratory measurement and many other subjects. Some knowledge of the principles of the statistical approach is now necessary so that doctors can make some judgement for themselves of the validity of the claims for medical advances made in journals and other communications. Instruction in statistics is a necessary part of the process of producing a graduate who can apply a scientific outlook to his future experience.

Medical students often find statistics difficult and are not always convinced of the value of the subject for their purpose. Some of their difficulties are real, for the basic logic of probability assessment is often unfamiliar to medical students and cannot be understood without time and thought. On the other hand unnecessary problems have sometimes been created by a sterile emphasis on algebraic and arithmetical manipulations which have little relation to the principles or practice of medical applications. The educational value of statistics can only be realised, in our view, by concentration on its function in the assessment of medical evidence. The technical mathematical apparatus of calculation must, like many other techniques, be taken on trust by most students. Teaching should not be confined to vital statistics, which in some medical schools was the only branch of the subject taught until recently. Moreover, statistics is not computing; its part in the course is not dependent on developments in the use of high-speed electronic computers for medical purposes. Such developments demand special and separate instruction. A knowledge of statistical principles will, however, be very important in framing questions to put to computers, and in interpreting the answers.

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\**Evidence of the Society for Social Medicine. British Journal of Social and Preventive Medicine, Oct. 1966, Vol. 20, No. 4, p. 153.*

The length and content of the teaching to be given in statistics must be decided by each medical school. The problems which require statistical treatment should be seen by the student to arise naturally from the study of health and disease, but he cannot be introduced to more than a fraction of the application of statistical methods in medicine and in the biological sciences; suitable opportunities occur at many points in the curriculum and much will depend on the interests of individual teachers. Instruction can perhaps best be divided into three stages. First, the basic principles of statistical logic and methods should be taught within a reasonable compact period, preferably after the student has gained a good knowledge of the medical sciences and their methods. The aim should be to introduce the ideas of measurement in medicine and the interpretation of biological observations; there are advantages in using a title which conveys this aim, rather than "statistics". Examples should be based on human variable and drawn from other subjects which are being studied at the same time e. g. physiology or biochemistry. The emphasis throughout should be on the meaning of results rather than on formal calculations, but experience in handling data is important in order to stress that the purpose of statistical methods is to draw quantitative conclusions from real observations. If time is available (perhaps in an optional module) some instruction can be added on the planning of experiments and surveys and on the maintenance and uses of medical records. More than half of the time devoted to basic teaching in statistics should be spent on practical and tutorial work, preferably in small groups.

The second stage of instruction in statistics should consist of several carefully prepared sessions of joint teaching, mainly but not exclusively with clinical departments, spent in discussing the statistical aspects of a medical problem which comes into the curriculum of the department concerned. The statistician must collaborate closely with the staff of the other departments and must become familiar with their teaching and the medical implication of the problems discussed. Several different topics, occupying short period are preferable to a single extended project. Examples of possible topics are testing of drugs, adverse reactions to drugs, bio-assay, clinical signs and diagnosis, surveys of community health, social factors in disease (smoking and lung cancer or bronchitis), growth of micro-organisms, cell counts and variations in human diet.

The third stage should introduce the student to vital statistics, which is concerned with a particular field of medical study rather than with the general logic of quantitative assessment. The topic is best included on community medicine and should cover mortality and morbidity measurement, with an introduction to the life table. A short account of problems of population growth should be given, preferably in conjunction with instruction in family planning.

An adequately staffed department or sub-department of statistics is

desirable within each medical school, but first-class medical statisticians are scarce. The teacher should have had some experience of modern research on the application of statistics in some field of medicine. He will then not be limited in his scope either to formal arithmetical manipulation which are of no interest to the typical medical student, or the practical but out-moded techniques. If a competent teacher with such experience is found there is no need to lay down rules about whether his degree should be in medicine, mathematics, or indeed any other subject, or whether he should be located in any particular department.

<i>Compulsory Subjects</i>	<i>No. of Units Required</i>
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55 units, as follows :

Cell Biology (CH) Structure, genetics, microbiology etc.	9
Man and his Environment (ME) Epidemiology, evolution genetics, statistics	5
Anatomy and Physiology (AP)	13
Biochemistry (including metabolism) (BC)	9
Behavioural Sciences (BS) Psychology and Sociology	5
General Pathology and Pharmacology (PP) Introduction to Clinical Method (CM)	7

#### *LIMITED ALTERNATIVES*

Nine units in subjects chosen from the following list, not more than one from each group :

- (a) Further Biochemistry  
Further Physiology  
Further Anatomy
- (b) Experimental Pharmacology  
Experimental Pathology  
Experimental Biology
- (c) Genetics  
Statistics

(d) Further Psychology  
Further Sociology

*“Demographic Trends”*

Changes in the structure and composition of the population; the analysis of mortality, fertility, marriage, divorce, ethnic and other factors. The significance of an ageing population, change in family size and in the working population. Population control and family planning.

**Recommendations under the auspices of W. H. O.**

WHO Technical Report Series No. 216 incorporates recommended requirements for schools of public health under paragraph 5.3.2. of the Report with caption ‘Health Statistics’. The following paragraph is included.

“A course in health statistics should aim primarily at giving the student an orientation towards a population as the unit of public health, concept of quantification and some skills in elementary statistical techniques.

The material included in this course should cover :

- (1) The “why” and “how” to assemble the needed statistical information, touching upon various circumstances (legal, administrative and social) which affect the collection and comparability of data in different countries.
- (2) Interpretation of data, stressing comparability and adjustment of rates and ratios, and concepts of variability, correlation and sampling.
- (3) Presentation of data, including the use of charts, diagrams, graphs and tables.
- (4) Description of modern developments in methods of data collection, analysis and presentation”.

In WHO Technical Report Series No. 239 on ‘Internationally Acceptable Minimum Standards of Medical Education’ which is a report of a Study Group, the following observations/remarks appear.

“.....The Social Sciences have gained considerable importance in the eyes of most medical educators, and mathematics is considered indispensable for a proper evaluation of statistical biological data and of scientific advances and therapeutic proposals.”

Under intensified training in preventive medicine, the following observations are noteworthy :

"Essentially, the teaching of preventive medicine is based on the fundamental concept of human ecology (interrelation between man and his environment). This concept is expatiated in such disciplines as biostatistics, demography, and epidemiology and applied to environmental sanitation, food, hygiene, housing and major public health programmes such as mother and child care, school health, venereal diseases, tuberculosis, leprosy, vaccinations and in many countries malaria control or eradication."

As a part of the content of the medical curriculum, the following recommendations for biostatistics are given :

Biostatistics (particularly medical statistics) is the principal investigative and analytical instrument of epidemiology and should form a strong section of the department of preventive medicine. Every effort must be made to introduce statistical concepts at all stages of the student's education; indeed, this instruction can appropriately begin during the pre-medical period in physics and biology and is especially applicable to anatomy, where human anthropology, biostatistics achieved some of its triumphs. It is also essential to the rational study of drug action. In brief biostatistics is a fundamental ingredient of the philosophy of science.

### **Course Content in Bio-statistics Recommended by the Medical Council of India**

As a part of the professional education recommendations of the Medical Council of India adopted in November, 1964 and June, 1965, the Council indicated the statistical content of the medical courses. The recommendations of the Council were partly general and partly specific. The universities and medical colleges are expected to lay down the details of the course content within the framework of the recommendations of the Council. As a background to the course content laid down by the university, the recommendations of the Council are summarised below:

#### *1. Undergraduate medical curriculum Pre-clinical subjects:*

- (i) Introduction of Statistics.
- (ii) Throughout the course of training due attention of the students drawn to
  - (a) Community medicine

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\*For details please refer to document—Professional Education Recommendations of the Medical Council of India, 1966.

- (b) Psychology
- (c) Bio-statistics
- (d) Principles of Genetics
- (e) Family Planning and some knowledge of National Health Plan
- (f) Initiation into Methodology of Research

## *II. Social and Preventive Medicine*

The following detailed curriculum for Preventive and Social Medicine *inter alia* including Bio-statistics, Vital Statistics, etc., is laid down for Pre-clinical period of the M.B.B.S. Course.

- i) Personal Hygiene
- ii) Bio-statistics and Vital Statistics.
- iii) Human Ecology
- iv) Elementary Psychology
- v) Elementary Social Science
- vi) Normal Growth and Development
- vii) Nutrition and Dietics.

A number of these items would be undertaken in collaboration with the Department of Physiology and Bio-chemistry, and should form an integral part of their teaching.

For the clinical period of the M.B.B.S. course, the following subjects should be included in the teaching programme:

- i) Medical Statistics, including collection, tabulation, presentation and the interpretation of data, and the use of statistical methods.
- ii) Principles of Epidemiology.
- iii) Communicable Diseases.
- iv) Public Health Administration, including requirements of international health, etc.
- v) Advanced courses on nutritional deficiencies.
- vi) Every student should be required to submit one satisfactory written history of community health undertaken under the guidance of

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the staff of the Social and Preventive Medicine in a rural area, and one written case history of a patient followed up with the assistance of the epidemiological unit in co-ordination with the department concerned and the Department of Preventive and Social Medicine.

*III. Schedule of teaching of Preventive and Social Medicine for undergraduate studies in medical colleges (including teaching of Bio-statistics)*

- (a) Pre-clinical Period-16 months  
Total hours available-50

<i>Subject</i>	<i>Didactic (lecture hours)</i>	<i>Visits</i>	<i>Practical Discussion classes/ seminars</i>
(i) Genetics	4	—	—
(ii) Bio-statistics	3	—	4
—Introduction to Bio-statistics			
—Collection, Tabulation and Presentation of data.			
—Variation, frequency, normal and skewed curves			
—Single figures to represent mass data, mean, mode and median.			
—Measure of dispersion from mean.			
—Range, standard variation and standard error.			
—Variability of observations.			
—Tests of significance.			

## (b) Clinical Period—3 years

<i>Subject</i>	<i>Didactic Lectures (Hours)</i>	<i>Visits</i>		<i>Practicals (Hours)</i>
		<i>Place of</i>	<i>Hours</i>	
(i) Medical Statistics	10	—	—	4
—Need for Vital and Health statistics				
Vital Health Statistics in India				
—Registration of births and deaths and notification of communicable diseases in India				
—Rates and ratios relating to nationality, mortality and morbidity				
—Standardised death rates				
—Life tables				
(ii) Demography and Family Planning	6	—	—	—
(iii) Applied aspects of Genetics	3	—	—	—

While laying down the syllabus, the Council has emphasized that within the broad principles the details are left to the universities. These are the minimum recommendations of the Council. Within the broad principles enumerated above, experiments in medical education may be encouraged. There should be vertical and horizontal integration of teaching throughout the Course.

#### IV. Additional items to be included as foot noted in the under-graduate medical curriculum :

- (i) The students will be imparted instructions on elementary principles of psychology, genetics, statistics and concepts of nuclear medicine, etc.

- (ii) Special emphasis should be laid on study of Health and National Plans.
- (iii) During their period of study, they should be made to take interest in research projects and on problems of investigations and submit a review which may be given due credit at the final examination.

### **Indian Association for the Advancement of Medical Education**

The Indian Association for the Advancement of Medical Education held an annual conference on post graduate Medical Education in 1965. In this conference, a number of papers were presented and recommendations on different aspects of medical education were made.

A major objective in teaching biostatistics should be to encourage statistical thinking and provide sufficient caution while using statistical tests from some statistical book. It is true that the lectures of laboratory sessions in statistics by themselves would not make an investigator sufficiently trained without some personal guidance and experience. Nevertheless statistics should be an important basic subject in the medical curriculum that every student can :

- (a) understand the principles of handling and presentation of data.
- (b) learn a few common concepts used in statistical theory such as the measures of central tendency, dispersion, correlation, probability etc., and be familiar with the usual terminology used in statistics.
- (c) acquire an ability to read or review critically any studies or literature pertaining to this subject.
- (d) regulate thinking through the major problems and biases that might occur in the course of his own research or study, and
- (e) obtain an insight into the arguments and implications involved in statistical inference.

To achieve these objectives every post-graduate student in medicine should undergo a course of at least 35 one-hour lectures and 15 two-hour practical classes. The course should preferably be spread over a 6-month period. There should be one compulsory final examination in the subject.

**Course content and allotment of time**  
**Content**

**1. Descriptive Statistics :**

		<i>No. of hours for</i>
	<i>Theory</i>	<i>Practical</i>
(a) Introduction-aim and scope of Biostatistical methods	2	—
(b) Collection of Data-Preliminary ideas	2	—
(c) Presentation of Data-Tabulation-Diagrams-graphs	3	4
(d) Measures of central tendency and dispersion	4	4
(e) Concepts of correlation and regression	2	2

**2. Statistical Inference :**

(a) Elements of Probability	2	2
(b) Elements of sampling	2	2
(c) Statistical estimation	2	2
(d) Tests of significance	3	4
(e) Testing Hypotheses	2	2

**3. Some special problems in Biostatistics :**

(a) Design of clinical trials	2	2
(b) Problems of field studies	2	2
(c) Vital and Health Statistics	3	2
(d) Hospital Statistics	2	2
(e) Misuses of Statistics	2	2

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## PROFORMA 1

### Curriculum Content of Biostatistics to Under-graduate Medical Students

1. Name of the Medical College/Institution.
2. Dept. responsible for the teaching of Biostatistics
3. Names and qualifications of persons who teach Biostatistics in Medical College
  - (i)
  - (ii)
  - (iii)
4. Curriculum content :—

Topics covered* (Please give in detail as to the extent of)	No. of Lectures	No. of Practicals	Year of M.B.B. course during which the subject is taught
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\* includes vital and health statistics also

5. Any other teaching method (other than didactic) employed for teaching of Biostatistics.
6. Particulars of statistics, if any, working in your college besides those listed under (3) above.
7. Any remark or additional information on this.

**PROFORMA 2**

**Professional background of statisticians  
working in your organisation**

1. Name & Designation :
2. Sex : Male/Female
3. Age :
4. Educational Qualification :

Degrees/Diplomas	Year	Institute/University
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5. Employment Record :—

Post held	Duration	Teaching/ Research	Scale of pay
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6. Details of the research papers published, if any .
7. Whether member of any scientific society.
8. Awards, Honours, Scholarships etc. received.
9. Foreign countries visited.

*Appendix-*

**Items of Statistics prescribed by the University and  
those taught in Medical Colleges**

<i>Topics</i>	<i>No. of lectures</i>	<i>No. of practicals</i>	<i>Year of course where taught</i>
1	2	3	4

**ANDHRA PRADESH**

**Andhra University, 1964**

(Department of Preventive and Social Medicine)

Epidemiology and Statistics, including general principles of epidemiology, studies in the understanding of diseases in individuals and among populations. Use of statistics as a tool in the analysis of control of the chain of diseases, causation and effects.

Final M.B.B.

*Andhra Medical college, Visakhapatnam*

- (a) Objectives: To give an understanding of the scientific and research methods of quantitative methodology, and give practical experience in the handling of biological data 15 NIL Final Year
- (b) Syllabus content: (1) General principles of scientific methods
  - (i) stating the problem
  - (ii) study and analysis of what is already known, and connecting

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1

2

3

4

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it to the unknown, (iii) evaluating resources, (iv) collecting data with adequate controls, (v) analysing results and follow-up

2. Nature of data collected in medicine and public health: laboratory, clinical health surveys, and special epidemiological studies, routine vital statistical reporting and census research techniques.

3. Importance of controls

4. Theory of sampling

5. Presentation and analysis of data measures of position, methods of measuring scatter correlation, rates and ratios, and significance tests

#### *Kurnool Medical College, Kurnool*

Information not given	6	NIL	5th Year (Integrated MBBS)
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#### *Sree Venkateswara Medical College, Tirupati*

1. Vital and Biostatistics	1		
2. Census	1		
3. Calculation of mid-year population	1	1	4th Year MBBS.
4. Rates and indices	2	2	
5. Standardisation of rates	1		
6. Life tables	1		
7. Registration and collection of vital statistics	1		
8. Tabulation	1		

1

2

3

4

**Osmania University, 1968**

## (Department of Preventive &amp; Social Medicine)

Bio-Statistics	12 hours	2nd, 3rd, 4th and Final Year
(a) Steps of scientific method		
(b) Importance of controls in sampling		
(c) Types and collection of data		
(d) Analysis of data		
(e) Morbidity and mortality rates		

*Institute of Medical Sciences, Osmania Medical College, Hyderabad*

## (a) Under-graduate

Vital statistics	2	2	
Statistics— Introduction	1	—	4th year MBBS
Presentation of data	2	5	(Integrated)
Averages	1	1	
Variation	1	1	
Measures of variation	1	2	
Tests of significance	1	2	

## (b) Post-graduate: (Diploma in Public Health).

## Statistical Methods :

Introduction	1	—
Collection and classification of data, tabulation, frequency distribution, bivariate tables	2	2
Mechanical processing punch cards	1	—
Preparation of questionnaires	1	—
Diagramatic and graphic presentation	2	8
Ungrouped data, averages and measures of dispersion	2	1
Grouped data, averages and measures of dispersion	3	1
Curve fitting: St. Line	1	1
Correlation and Regression	1	—

1	2	3	4
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Probability	1	—	
Binomial and poisson distribution	1	—	
Normal Distribution	1	—	
Sampling	2	—	
Stat. inference	1	—	
Standard errors and students 't'			
Chi-square tests	1	1	

### Demography, Health and Vital Statistics

Demography, macro-micro population studies	1	—	
World population history	1	—	
Population theories, composition of population	1	—	
Population census	1	—	
Health and vital statistics	1	—	
Uses of vital statistics system	1	—	
Vital statistics system in India defects etc.	1	—	
Vital statistics system in Andhra Pradesh	1	—	
Morbidity statistics and measurements of morbidity	2	2	
International classification of health data	1	1	
Methods of population estimation	1	1	
Mortality statistics, mortality rates, standardization of rates	3	3	
Life table	1	1	
Health indices	1	1	
Fertility and fecundity and fertility measurements	3	2	
India population trends composition, distribution	1	—	
Populution problem	1	—	
Field visits	6	—	

### ASSAM

Gauhati University, 1967

(Department of Preventive and Social Medicine).

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### Pre-Clinical Period

Bio-statistics, including principles and elements of statistics, bio-statistics & medical statistics, collection, tabulation of data and skewed curves. Mean, mode, median, dispersion from mean, range, standard deviation and standard error, variability of observations and tests of significance.

Pre-Clinic  
MBBS

### Clinical Period

Medical statistics, including need of vital and health statistics, registration of births and deaths, notification of common diseases; rates and ratios relating to mortality and morbidity, standardised death rates, life tables, etc.

Demography and family planning

### *Assam Medical College, Dibrugarh*

1. Introduction to bio-statistics	1 hr.	- During the preclinical period (18 months) in the 4½ year MBBS Course
2. Collection, tabulation and presentation of data	1 hr.	
3. Mean, mode and median	1 hr.	
4. Measures of dispersion from mean	1 hr.	
5. Range, standard deviation and co-efficient of variation	1 hr.	
6. Concept of sampling and a sampling methods	1 hr.	

### BIHAR

### *Darbhanga Medical College, Laheriasarai*

1. Introduction
2. Sources of health statistics
3. Uses of vital statistics

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4.	System of reporting and recording and difficulties and defects		
5.	Census, method of calculation of vital statistical rates, ratios and indices	15	NIL 3rd and 4th year (Till the University Examination of Final Part I).
6.	Birth rate, crude death rate, specific rates, I.M.R., M.M.R.		
7.	Proportional mortality rate by cause, case fatality rate, sex ratio		
8.	Vital index		
9.	Standardised death rate		
10.	Mean, median, mode, range and standard deviation		
11.	Life table		
12.	Statistical significance test		
13.	Morbidity statistics, sources of morbidity statistics		
14.	Notifiable diseases		
15.	Difficulties in study of morbidity		
16.	Incidence rate, prevalence rate		
17.	Demography—Sources of demographic data		
18.	Growth of population		
19.	Population explosion in India		

### GUJARAT

**Gujarat University, 1967**

(Department of Preventive & Social Medicine)

Elements of vital statistics, calculation of population, birth and death rates and infant mortality rates, causes and prevention of infant mortality, data in maternity and child welfare.

3rd Year  
MBBS

*Smt. N.H.L. Municipal Medical College, Ahmedabad*

Definition and scope of biostatistics.  
Principles of designing the experi-

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ment of a survey. Methods of collecting data, classification and tabulation of data. Frequency distribution table and some of its examples. Different types of graphs and diagrams. Measures of central tendency, mean, median and mode. Measures of variations—Mean deviation, variance, standard deviation, coefficient of variation. Principles of sampling-random sampling and stratified random sampling. Normal distribution tests of significance “t” test and chi-square test. Correlation coefficient.

1 per week No 15 to 20 Information years

2nd & 3rd  
MBBS

### Vital and Health Statistics :—

Importance of vital statistical data in public health. Methods of collection of these data—registration of births & deaths, census, national sample surveys. Estimation of population, density of population. Different mortality and vital statistical roles and their significance. Life tables. Expectation of life.

### *B.J. Medical College, Ahmedabad*

Introduction to biostatistics, uses of statistics

1

None Final  
MBBS

Sources of morbidity statistics, death certificate

1

‘t’ test...1  
‘x’<sup>2</sup> test...1

Collection of health statistics and vital statistics in Gujarat

1

Measures of central tendency

1

Standard deviation, standard error, test of significance

1

1	2	3	4
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*Govt. Medical College*

Sources of collection of data, bio-statistics (Health, Medical & Vital)	12	2	1st MBBS 2nd term
Demography			2nd MBBS
Presentation of data			1st term
Methods in vital statistics			3rd MBBS
Population problems			1st term

*Shri M.P. Shah Medical College, Jam Nagar*

Introduction			
Sources and collection of statistics	16	8	Final MBBS
Sampling and designing of experiment			
Presentation of statistics			
Averages			
Variability of observations			
Measures for individual variability			
Normal distribution and normal curve			
Measures for sampling variability			
or			
Test of significance			
Standard error of mean;			
't' test			
Proportions			
$\chi^2$ or the Chi-square test			
Correlation coefficient ( $r$ )			
Methods in vital statistics			
Life table			

**University of Baroda, 1966**

(Department of Preventive and  
Social Medicine)  
Population growth and control

3rd Year

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*Medical College, Baroda*

**Biostatistics :**  
 (Bradford Hill's book upto standardisation)

-do-

-do-

-do-

**Statistics :**

-do-

-do-

15 Lect-cum-practicals.	Pre-medical year.
15 Lect-cum-practicals.	1st Premedical year.
15 Lect-cum-practicals.	1st premedical year.
15 Lect-cum-practicals.	2nd clinic year
4	Final Year
1	
4	

**Jammu & Kashmir State**

*Government Medical College, Sri Nagar*  
 Designing of experiment sampling

6

—

1st year.

**Kerala State***Medical College, Trivandrum*

1. Presentation of data
2. Average, dispersion and correlation      16 hrs.      14 hrs.      3rd & 4th
3. Sampling, sample tests of significance chi-square test      year.
4. Census
5. Vital statistics

*Kottayam Medical College, Kottayam*

1. Statistical methods-introduction-and field trials of drugs-need for collection and classification of data tabulation and presentation by diagrams      2      —      3rd & 4th year of the course.
2. Averages—mean, median, mode-calculation from ungrouped and grouped data      1      —

	1	2	3	4
3. Measures of variability-range, mean deviation, standard deviation-calculation from ungrouped and grouped series		1	—	
4. Coefficient of variation, limits constraining certain proportions of the observation— and a brief introduction to the tests significance		1	—	
5. Introduction to vital statistics-- Use of statistics for the P.H. Work—Birth and death registration—their importance, laws of registration—International form of certificate of cause of death		1	—	
6. Birth rate, general fertility rate, growth rate—application and uses of these rates—census—method and figures—estimation of population—natural increase—method, A. P.& G.P. methods—theory of population growth & population explosion		3	—	
7. Death rate, infant mortality rate, maternal mortality rate, pre-natal mortality rate, definition and use of the rates and causes of mortality and their statistical classification, standardisation of rates-direct method in details		3	—	
8. Sampling—uses and application & methods of sampling		1	—	
9. Morbidity rates—uses, surveys and rates and used—brief introduction to the conduct of surveys and evaluation		1	—	
10. Life table-principle and explanation of the table—uses of L.T. & application of L.T. technique		1	—	

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*Medical College, Calicut*

1. Elementary statistical principles and methods: central tendency, dispersion, probability, sampling and correlation
2. Health statistics : Birth rates, death rates, infant mortality rate, maternal mortality rate, cause by death rate, fertility rates, morbidity statistics, health surveys
3. Demography : Census, population dynamics, population projection, population explosion and its medical socio-economic and cultural problems. Evaluation of family planning programme

5 - 3rd year

5 12 4th year

2 6 4th year

*T.D. Medical College, Alleppey*

Collections of data, tabulations of data, diagramatic and graphic representation. Averages, dispersion, correlation, coefficient, normal curve. Vital statistics. Sources of collections. Birth and death certificate-its importance, various rates and ratios. Standardizations life table, census and population growths

15 hrs. NIL 3rd to 4th year.

**MADHYA PRADESH**

(Department of Preventive & Social Medicine).

Vital statistics (6 hours of teaching), including composition of population, registration of births and deaths, collection of data, mortality and morbidity statistics, planning of surveys, demographic aspects of family planning, practical training, including practical exercises in bio-

1	2	3	4
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statistics to be done as class or home work with a view to enable them to work out statistical methods themselves

*S.S. Medical College, Rewa*

1. Introduction and scope of biostatistics in medicine	1	1	1st to 3rd year.
2. Collection and tabulation of data	1	1	
3. Calculation of averages	1	1	
4. Measure of dispersion	1	1	
5. Problems of sampling, tests of significance	1	1	

*M.G.M. Medical College, Indore*

1. Introduction to health statistics	1	—	2nd Professional MBBS.
2. Sources and collection of the health and vital statistics data	2	—	do
3. Vital rates	2	—	do
4. Averages, standard deviation	1	4	do
5. Sampling and its different types	2	—	do
6. Tabulation, graphs, diagrams and charts	—	6	do
7. Importance of test of significance	1	—	do

*Pt. J.N.M. Medical College, Raipur*

1. Census, vital registration	2	1	2nd Professional i.e.
2. Central tendency, dispersion	2	2	
3. Birth, death, morbidity rates	2	1	after 1½ year
4. Calculation of population	1	1	of admission
5. Standardisation of rates	1	1	to the completion
6. Life table	1	1	of 3rd year.
7. Test of significance	1	1	
8. Demography	2	1	

*G. R. Medical College, Gwalior*

1. Statistical methods:—	4	2	2nd & 3rd year.
Collection and tabulation of data			
Averages/Ratios/Proportions/Disper-			

	1	2	3	4
sion/Standard errors	Deviation/Standard			
Association				
Probability and chance				
Variation and significance	controlled			
C.L. Trials				
2. Demography:—		2	1	
Population/classification/distribution/census				
3. Vital and health statistics. Measure ment of data of birth, death, marriage, divorces, morbidity, accident, standardization	4		2	

### **MAHARASHTRA**

#### **University of Bombay, 1968**

Demography and Bio-statistics  
Vital Statistics

Pre-clinical (1½ years) Clinical (3 years)

#### *Topiwala National Medical College, Bombay-8*

- |  |   |   |                               |
|--|---|---|-------------------------------|
| 1. Statistical rates—Infant mortality, maternal mortality.   | 3 | — | 3rd MBBS 1st, 2nd, 3rd terms. |
| 2. Population trends in Greater Bombay since 1901. Study of birth statistics in Greater Bombay since 1901. Study of death statistics in Greater Bombay since 1901. Study of relation of statistical data. Methods of collection of statistical data in Greater Bombay. Legal permission in connection with vital statistics in Bombay Corporation's Act. Lecture/Dem. at Health Deptt. | 8 | — | 3rd MBBS 1st term.            |
| 3. Introduction to statistics. Methods of collecting data. Classification, tabulation & graphic representation   |   |   |                               |

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of data. Measures of Central tendency (mean mode, median). Notes on variability (M.D.S.B. & C.V.) Estimation of population, and different rates. Examples exercises. — — — 1st MBBS 1st term

*Seth G.S. Medical College, Parel, Bombay-12*

Public health rates and ratios	6	—	2nd MBBS
Survey techniques			
Census			
Frequency distribution	6	—	3rd MBBS
Averages			
Elementary vital and health statistics.			

*Govt. Medical College, Aurangabad*

Collection of data, sampling methods, presentation of data, centering constants variability and measures of variability, standard deviation, normal curve and its application.			
Tests of significance common falacies	17	13	2nd MBBS Ist term.

Vital statistics

*Grant Medical College, Byculla, Bombay*

Statistics:- Centering constants, standard deviation, tests of significance — $X^2$ , t. Vital Statistics:- Rates and ratios, morbidity, mortality, census birth and death rates, morbidity statistics, demography	—	—	4th year
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*Armed Forces Medical College, Poona-1*

Introduction to biostatistics	2	—	1st MBBS 1st term
Collection, tabulation & presentation of data	1	2	2nd MBBS

	1	2	3	4
Variation, frequency, normal and skewed curve		2	2	
Measures of central tendency-mean, median, mode		2	2	
Measure of dispersion—range, mean deviation and S.D.		2	2	
S.E. of mean and proportion	1	1	2	
Sample tests of significance regarding difference between two means, two proportions		4	6	
Need for vital & health statistics in India and Armed Forces	1	—	—	
Rates relating to natality, mortality and morbidity	2	4		
Standardised death rates	1	1		
Life tables	1	1		
International classification of diseases	1	1		

### Marathwada University, 1963.

(Department of Preventive and Social Medicine) Vital Statistics: Significance, methods and defects of vital statistics, compilation and estimation of population, various rates concerned with vital statistics — — — 3rd year M<sub>E</sub> Examination

### Miraj Medical College, Miraj

Introduction to bio-statistics and vital statistics	1	One session of 1st & 2nd 2 hrs. duration	2nd MBBS
Collection of data	1	do	
Tabulation and presentation of data	1	do	
Centering constants-mean, median, mode	1	do	
Measures of dispersion-range, standard deviation	2	do	

	1	2	3	4
Variability of observation in nature	1	do		
Sampling techniques-random sample, stratified samples	1	do		
Standard error	1	do		
Standard error of measures & proportions	1	do		
Students test	1	do		
X <sup>2</sup> test	1	do		
Registration of births and deaths and notification of communicable diseases in India. Rates and ratios, relating to natality, mortality and morbidity, life table	2	do		

*V.M. Medical College, Sholapur*

Bio-statistics : Presentation of data to (Chi-square) test (X <sup>2</sup> )	2	12	2nd MBBS 1st term.
Vital and Health Statistics : Collection & uses of statistics	8	—	
Census-Birth rate, fertility rate, mortality rate-specific and standardised, morbidity, statistics			

*Government Medical College, Nagpur*

Definition & scope of statistics	10 Bio-statistics	Practicals are not taken separately but given as assignments which the students are required to solve in Biostatistics practicals, records above five assignment covering the whole course are given.
Definitions and explanations of terms: Demography, biostatistics biometrics, vital & health statistics.	(4 vital stat.) total —	
Tabulation of raw data. Formation of frequency tables.	14	
Graphical representation: Bar, pie diagram, histogram, frequency curve, ogive, scatter diagram ratio charts		
Averages: mean, median, mode, calculation for grouped and ungrouped data		
Selection of an appropriate average		
Measures of variation: range,		

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standard deviation, coefficient of variation

Tests of significance, tests for difference of (i) means, (ii) proportion (iii)  $X^2$  test for goodness of fit and homogeneity

### **mysore**

#### *Sri J.J.M. Medical College, Davangere*

Induction in reasoning. Frequency distributions. Growth curves. Correlation and regression probability

One hour per week

Nil Preprofessional course

#### *Government Medical College, Mysore*

Demography : vital statistics, population assess and health-statistics. Also includes descriptive statistics

40

10

Preprofessional course & MBBS

#### *St. John's Medical College, Bangalore*

Elementary statistics-collection, tabulation & presentation of data variations, frequency distribution, normal and skewed curves, mean, median, mode, standard deviation, tests of significance

12

3x2 hrs,

1st & Final MBBS

#### *N. K. E. Society's Medical College, Gulberga*

Principles and elements of statistics, bio-statistics and medical statistics, vital statistics and elementary statistical methods, population-census-registration of births and deaths, notification of communicable disease, personnel engaged local district. Provincial : central-international Statistical methods-tabulation-gra-

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phs-spot maps-averages-rates-methods of calculation of birth and death rate. Infant mortality rate-maternal mortality rate and other mortality and morbidity rates; rates-variations-statistical constants-mean, median and mode-normal curves; common errors in the collection, analysis and interpretation of data are to be pointed

25

Taught in the 1st MBBS, but examination in the final year of MBBS

### *Karnatake Medical College, Hubli*

#### Bio-statistics :

Use of vital statistics, definition of data and types of data, presentation of data, measures of central tendency, measures of dispersion, standard deviation and its uses, tests of significance

10      6      1st MBBS

#### Vital Statistics :

Census, methods of estimation of population, features of Indian population, calculation of various vital indices, adjusted deaths rates, life table

6      —      Final MBBS

### *Kasturba Medical College, Manipal, S. K.*

Statistics : Measures of central tendency, mean, mode, median, histograms, frequency polygons, use of Newton's formula for interpolation with equal intervals, calculation of co-efficient of correlation, standard error and significance test samples, theory of probability

1 hr. — Preprofessional per week

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*Jawaharlal Nehru Medical College, Belgaum*

Principles and elements of statistics, biostatistics and elementary statistical methods; population census, registration of births and deaths, notification of communicable diseases, personnel engaged-local-district-provincial-central - international; statistical method-tabulation graph, spot [maps-average-rates, methods of calculation of birth and death rates, specific death rate, infant mortality rate-maternal mortality rate and other mortality and morbidity rates, variation-statistical constants-mean, median and mode-normal curves; common errors in collection, analysis and interpretation of data are to be pointed out

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4

2nd MBBS  
1st term

*Government Medical College, Bellary*

Principles and elements of statistics, bio-statistics and medical (vital) statistics and elementary statistical methods.

3

Pre-clinical

Population-census-registration of birth and deaths, notification of communicable disease, personnel engaged-local-district-provincial-central-international.

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1st & 2nd year  
clinical

Statistical methods-tabulation-graphs -spotmaps - averages - rates, methods of calculation of birth and death rate, specific death rate, infant mortality rate-maternal mortality rate and other mortality and morbidity rates

8

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Final MBBS

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Rates-variation-statistical constants.  
 Mean-median & mode-normal curves; analysis and interpretation of data are to be pointed.

### **ORISSA**

**Sambalpur University, 1969**

(Dept. PSM)

Information not given.

Final MBBS

**Berhampur University, 1969**

(Dept. PSM)

Medical Statistics, vital statistics and elementary statistical methods. Population, census, registration of births and deaths, notification of common diseases, statistics of personnel engaged at local, district, provincial and central levels. International statistical methods. Tabulation of data, graphs, spot maps. Average rates, methods of calculation of birth rate, death rate, specific death rates, infant mortality rates and other mortality and morbidity rates. Rates, variation, statistical constraints, mean, median and mode; normal curve. Common errors in collection, analysis and interpretation of rates

20 — —

3rd year MBBS  
but examined  
in Final Year.

Practical work during 3rd year.

Vital statistics, bio-statistics & medical statistics

Practical work during 4th year.

Ecology, epidemiological methods,  
analysis and interpretation of data,  
epidemic investigations

*S.C.B. Medical College, Cuttack*

Curriculum contents not given	30	20	During year
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**PUNJAB**

*Govt. Medical College, Amritsar*

Introduction, sources and collection of statistics, sampling and design of experiments. Averages, variability of observation, measures for individual variability.	About 25 lectures	5	1st professional (practical work in final professional)
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*Christian Medical College, Ludhiana*

Introduction; Why statistics ? Uses of statistics in medicine and public health, steps in medical research, methods of comparison in biostatistics rates and ratios in public health, crude rates and standardized rates, life table and graphs. Age expectancy, variations in human physiology and anatomy. Descriptive statistics—mean, median, mode, standard deviation, standard error, Chi-Square test.	12	4	1st and 4th year
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Applied statistics in epidemiological survey.

*Punjabi University, Patiala, 1966-67*

Training in statistics among other subjects for 1½ academic years

1st professional M. B. S.

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*Govt. Medical College, Patiala*

Collection, compilation, analysis and presentation of vital statistics, with particular reference to i) Birth rate, ii) Death rate, iii) Infant mortality rate. iv) Maternal mortality rate, v) Growth rate etc.

8                  4                  2nd professional.

**RAJASTHAN***R. N. T. Medical College, Udaipur*

Vital & Health Statistics                  4                  --                  Final MBBS

*R. L. T. Medical College, Ajmer*

Elementary Biostatistics                  6 to 10                  —                  2nd and final MBBS

**University of Rajasthan, 1969**

(Dept. of PSM).

Bio-statistics : Introduction to bio-statistics, collection, tabulation and representation of data variation, frequency, normal and skewed curves, single figures to represent mass data, mean range, standard deviation and standard error

4                  —                  1st and Final MBBS

**Vital and Health Statistics :**

Need for vital and health statistics in India, registration of births and deaths and notification of common diseases in India, rates and ratios relating to natality, mortality and

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morbidity, standardised death rates, life tables.

*Medical College, Jaipur*

Bio-statistics:—Introduction to bio-statistics, collection, tabulation and presentation of data variation, frequency, normal and skewed curves, single figures to represent mass data-mean, range, standard deviation, standard errors

4                   3                   7th                   Seme-  
ster

Vital and Health Statistics :—Need for vital and health statistics in India, registration of births and deaths and notification of communicable disease in India, ranges and ratio relating to natality, mortality and morbidity, standardized death rates, life tables

8                   3                   7th                   Seme-  
ster

—                   3                   9th                   Seme-  
ster

*Sardar Patel Medical College, Bikaner*

(a) Statistical methods (mean, mode, median, value of central tendency, standard deviation, normal curve and test of significance)

(b) Graphical presentation of statistical data                   20

6                   7th, 8th &  
9th  
Semesters.

(c) Health statistics (uses, source, statistical indices for evaluation of various health services programme)

*S.N. Medical College, Jodhpur*

Definition and uses of statistics, sampling, presentation of data,

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average, mean, mode, median, standard deviation, vital statistics, health statistics.

8

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Final year

### **TAMIL NADU**

#### *Christian Medical College & Hospital, Vellore*

1. Descriptive statistics : Statistical inference, principles of data collection and demography      20      15      1st year  
Integrated
2. Vital & health statistics

The emphasis throughout the course is more on statistical thinking rather than on statistical arithmetic. Thus concepts are explained in various ways and different examples given. A manual is prepared and given to the students which contains basic statistical ideas and methods.

4      2      4th year  
MBBS

#### **Descriptive Statistics**

After a preliminary discussion on the measurement in biological and medical science, the students are introduced to the presentation of data arising out of biological and medical phenomena. They are taught various ways of condensing the data in the form of tables, diagrams and graphs. Subsequently they are introduced, to various measures of describing frequency distribution, in particular, the concept and calculations of mean, median, mode, standard deviation

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and co-efficient of variation are dealt with. Other measures of central tendency and dispersion are briefly introduced such as the geometric mean, the quartile, percentile etc.

Examples are then given of bivariate and multivariate population and measures of association introduced in particular the simple correlation and regression co-efficients are dealt with in details. The extension of this idea in calculating multiple correlation is briefly explained.

### Statistical Inference

The student is first exposed to the need for the ideas of probability and measuring change under a given set of circumstances. Probability distributions are then developed and in particular the binomial and normal distributions are explained. The student is then taught about principles involved in methods of sampling and calculation of standard errors. The basic of statistical inference is set out and the steps involved are discussed in relation to various types of hypothesis that may be tested or the various types of estimations that can be made. The concept of statistical significance is explained in relation to various practical examples.

### Collection of Data

The principles on collection of data are explained and the manner of

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drawing up of a protocol for any investigation explained in relation to various studies. The use of questionnaire and different methods of collecting data are discussed. The difference between experimental and observational studies and the problems involved in conducting these two types of studies are discussed. The role of experimental designs in specific situations are briefly introduced.

#### Demography

The principles involved in the study of population are introduced; in particular, the measurement of changes in the population are discussed. The description of population in terms of age, sex, occupational and educational status and their implications are discussed. The subject is taught with particular reference to the population problem in India.

#### Vital and Health Statistics

This includes a general discussion on the measurement of vital events; in particular about the commonly based natality, mortality and morbidity rates. The methods of estimating population during the inter-censal periods are taught and an idea of the registration mechanism in the countries is given. Vital statistical data of India and other countries are given for the current year, if possible for the latest available year and briefly discussed.

Importance is given to the study of the trends in the birth and death rates and of infant mortality rates in relation to the socio-economic development in the country.

*Thanjavur Medical College, Thanjavur*

Importance of quantitative approach in empirical studies, nature of variation in data arising in medical and biological studies, method of reasoning in scientific studies in directive or deductive process, scope of statistical methods—concept of population and sample.

Observation—data—methods of classification and tabulation in respect of one or two characters; formation of frequency distributions. Graphical and diagrammatic representation of data; simple diagram; bar diagram and pie diagram—scatter diagram.

Histogram and frequency curve; logarithmic graph, representation of growth curves; interpretation of graphs and charts.

Computation of arithmetic mean, median, mode, geometric mean, standard deviation and coefficient of variation.

Association of attributes, correlation and regression coefficient for ungrouped data. Importance of regression. Analysis on scientific

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basis ideas of statistical reasoning. Elementary ideas of probability. Importance of probability in statistics. Concept of random sample and sampling distribution. Basic ideas of statistical reasoning.

Collection of data, need for planning, sample studies and experimental work to obtain reliable information, general concepts of randomisation and replication and their importance in designing scientific experiments.

Fifty Nil 1st MBBS,  
five lectures Integrated  
per year course.

Vital and Health Statistics.

*Tirunelveli Medical College, Tirunelveli*

Quantitative approach to empirical data variation in biological data, classification measures of central tendency, diagrams, measures of variation, correlation and regression, probability, random sample and concept of sampling distribution, association of attributes, principles of experimentation and vital statistics.

20 20 1st year.

### UTTAR PRADESH

**Agra University, 1968**

(Dept. of PSM)

Elements of vital statistics, correct certification of cause of death

2nd Professional Part II.

*S.N. Medical College, Agra*

Demography

Vital statistics

Health statistics

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Statistics:	Averages Sampling- Mean and S.D. Probability Correlation coefficient Standard error Significance tests	Information not available
	Representation of data-tables, graphic representations	
	Practical exercises on the above topics.	

**Lucknow University, 1965-66**

(Dept. of PSM)

**Vital Statistics :-**

Population, registration of births and deaths, rates and averages, collection, compilation and tabula- tion of statistical data, common statistical assistance	36	8	MBBS
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*King George's Medical College, Lucknow*

Introduction to biostatistics.	1	—	3rd semester
Collection, tabulation and presenta- tion of data.	1	—	
Mean, median, mode and stan- dard deviation	2	—	
Normal and skewed and frequency curves	1	--	
Range, standard error and varia- bility of observation	2	—	
Test of significances	3	—	
Registration of births and deaths	1	—	

1

2

3

4

Rates and ratios relating to natality, morbidity and mortality (including vital statistics)	3	—	4th semester
Introduction to population growth and demography	1	—	

**University of Allahabad, 1968**

Introduction to Statistics	6	1st professional Exam.
Vital statistics, including important elementary statistical methods, rates and averages, population census, vital indices, registration of births and deaths, notification of diseases.		2nd Professional

*Motilal Nehru Medical College, Allahabad*

Meaning of statistics; importance in biology, medicine and public health; graphs and diagrams; mean, median, mode, standard deviation and correlation for ungrouped data; standard error of mean and tests of significance of difference in means (large samples), birth and death rates etc.	About 10	1	3rd year
---	----------	---	----------

*Jawaharlal Nehru Medical College, Aligarh*

Frequency distribution, geographical representation of statistical data. Mean, median, mode, standard deviation, quartile deviation, coeff. of variation, simple correlation, elementary idea of statistical population and random sample. Application of formulae of Chi-square, elementary rates and their definition, life table, health statistics.	15	—	4th year MBBS.
---	----	---	----------------

*L.L.R.M. Medical College, Meerut*

Introduction to Bio-statistics.  
Collection, tabulation and presentation of data, variation, frequency and normal distribution.

Averages-mean, mode and median, measurement of scatter around the mean—sd. range, standard error and standard deviation, tests of significance, vital statistics, health statistics.

**Banaras Hindu University, Varanasi, 1969-70**

(Dept. of PSM)

**Bio-Statistics :**

Frequency distribution, mean, median, mode, study of deviation by range, standard deviation; normal and skewed curves; diagrammatic representation. This will include practical exercises in data, especially compiled in Physiology or by students themselves. Teaching of bio-statistics shall be limited to develop the concept of understanding of mass of biological data.

**Vital Statistics :**

Importance of vital statistics, registration of vital events, compilation, analysis, interpretation, and utilization at peripheral level (corporation, rural areas, university campus, district). State level, national level and world level rates and ratios, death rates, infant mortality rates,

maternal mortality rates, incidence of diseases, prevalence of diseases, morbidity rates. This part of teaching will include field work as well as practical exercises and data with the peripheral agencies.

## Bio-statistics :

## Standard errors, tests of significance, basic principles of sampling.

*College of Medical Sciences, Varanasi*

a) Bio-statistics—Definitions & Importance	1	—	Pre-Clinical years.
Tabular and graphic presentation of data	2	4	„
Mechanical tabulation of data	1	1	„
Measures of central tendency	2	4	„
Measures of dispersion and skewness	2	4	„
Elementary ideas of sampling	1	1	„
Elementary ideas of normal distribution and its application	1	1	„
Sampling variation and elementary ideas of tests of significance	2	2	„

### b) Community Statistics

Definitions, importance and source	1	—	,,
Registration of births and deaths channels items and lapses	1	2	,,

(at registration  
centres) ,,

	1	2	3	4
Population estimation methods		1	1	Pre-Clinical years
Various health indicators		2	2	,,
Standardisation of rates & life tables		1	2	,,

## WEST BENGAL

University of Calcutta, 1962

## Principles and elements of — — 3rd and 4th y statistics, vital statistics and — — medical statistics

*Medical College, Calcutta*

## Introduction :

Sources of health statistics, morbidity statistics and vital statistics, morbidity and fertility rates sampling; health survey, standardisation of rates. Measures of central tendency. Demography. Problems of I.M.R. In India.

In India. 10 2 3rd and 4th

*R. G. Kar Medical College, Calcutta*

## Introduction of statistics and vital statistics census

Various rates and ratios and averages, morbidity and mortality statistics (States and India), life table, significance tests.

10            2            3rd and 4th

*Nilratan Sircar Medical College, Calcutta*

## Definition, use of statistics in clinical medicine and public health.

— — — — —

1

2

3

4

**Statistical Methods**

7

—

—

Source of data, collection of data, sampling, bias, definition of terms used, designing of experimental surveys schedule making, practical aspects of data collection and schedule filling, scrutinising of data sorting and tabulation of data, calculation of rates, ratios etc.

— — 3rd year.

Presentation of data, distribution, probability, normal averages, standard deviation, levels of significance, tests of significance, statistical fallacy

**Vital Statistics :—**

Definition, collection, compilation, tabulation

Census, determination of population the intercensus period

Consideration of different rates and health indices

Short comings in the collection of vital information and scopes of improvement

International classification of diseases; death certificates — — 4th year.

*Akuta Sommiling Medical College, Bankura*

Medical statistics and vital statistics (enlisted in the Calcutta University curriculum) 10 — — 3rd year.

1

2

3

4

**DELHI***All India Institute of Medical Sciences, New Delhi***Principles of Bio-statistics**

Introduction, aim and scope, definition of statistical methods, statistics and scientific method.

1

—

Most of the lectures are covered in the 1st year (1st semester).

Collection of data-Basic ideas of “Selection” (bias) in different situations.

1

Presentation of data-need for condensation or reduction—qualitative and quantitative data scales of measurement. Frequency distribution : Histograms-contingency tables.

2

1

Presentation (contd.)—graphs and charts

1

1

Descriptive statistics, measures of central tendency/position and measures of dispersion.

2

2

Normal distribution-properties-place in statistical work.

1

—

Elementary introduction to probability.

1

—

Tests of significance-basic logic-some common tests.

2

2

**Vital and Health Statistics—**

Introduction—need for diagnostic tools in community health-vital and health statistics as such tools-relation to demography.

1

—

2nd year  
4th semester.

1

2

3

4

Statistical study of population—  
“Composition” and “Change in  
composition”. Census and regis-  
tration of vital events-system of  
census and registration in India.      1

Definition of health—difficulty in  
measuring positive health-need for  
a negative approach-mortality and  
morbidity.

Measurement of mortality indices-  
standardisation international classi-  
fication of cause of death.      2      1

Measurement of morbidity-inci-  
dence and prevalence sources of  
morbidity surveys.      2      1

#### Statistics in Family Planning :

Demography-determinants of popu-  
lation growth. Fertility indices.  
(Revision of mortality concept also).      1      —      3rd year  
—      5th semester.

K. A. P. Studies in India      1      —

Basic concept of evaluation in rela-  
tion to Family Planning.

#### Seminars During Internship.

Vital statistics collection in  
Ballabhgarh including cause of  
death registration in rural areas-  
usefulness of such data.

Morbidity surveys.

**University of Delhi, 1964**

(Elements of medical statistics)      —

Pre-clinical

*Maulana Azad Medical College, New Delhi*

#### Statistical methods:

1. Definition. 2. Presentation of  
statistics. 3. Averages.

1	2	3	4
4.. Variability of observation. 5. Sampling. 6. Tests of significances	6	6	1st year

Vital and health statistics registration of vital events. Notification of dangerous diseases rates and ratios about fertility, morbidity and mortality Life table census, surveys and indices of healthiness.

8 — 4th year

### **HIMACHAL PRADESH**

#### *H. P. Medical College, Simla-I.*

Introduction	1	—	Pre-clinical year
Classification and tabulation	1	1	,,
Presentation of statistics	1	2	,,
Measure of central tendency	1	—	,,
Measure of dispersion	1	—	,,
Normal distribution	—	1	,,
Universe and sample	1	—	,,
Theory of sampling and estimation of mean	1	—	,,
Chi-square test	1	1	,,
Vital statistics—History, role of medical officers, system of collection of vital statistics in the country	1	—	Clinical
Population estimation and calculation of mortality data, and international death certificate	1	—	,,
Standardisation of death rates	1	—	,,
Sources and calculation of mortality rates	1	Nil	,,

### **GOA**

#### *Goa Medical College, Goa.*

Bio-statistics	8	4	1st MBBS
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Statistics related to Epidemiology	6	—	2nd MBBS
Vital statistics	—	4	3rd MBBS

**PONDICHERRY**

*Jawaharlal Institute of Post-graduate Medical Education and Reserach, Pondicherry—6.*

Elementary statistics	12	Combined 1st MBBS with lectures.
Vital statistics	5	4th MBBS (2nd clinical year).

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## **APPENDIX I**

### **Statistical Content of Post-graduate Medical and Health Courses**

*M.D. (C.H.; P.S.M.), DPH, DGO, Diploma in Health Education, etc.*

The need for statistics in the public health courses has been long recognised. The statistical content of the public health courses, therefore, is quite elaborate. However, there is hardly any regular teaching of statistics to postgraduate students of medical specialities other than P & S.M. The following is a review of the statistical contents of different courses so far as information is available.

#### **I. M.D. (Community Health) :**

This course is affiliated to Delhi University and the course is run by the NIHAE.

#### **Biostatistics and Epidemiology :**

- (1) Vital and health statistics system as a sub-system of health administration in India :
  - (a) organization; (b) procedures; (c) data generated by the system
  - (d) how utilised; (e) shortcomings; (f) steps taken for improvement of the system.
- (2) An information system for health administration—
  - (a) planning; (b) evaluation; (c) management and control
  - (d) performance budgeting; (e) financial budget as an instrument for planning and evaluation.
- (3) Statistical measurement and methods in the health administration process:
  - (i) Statistical methods including presentation of data, measures of central tendency, measures of variability, elementary concepts of probability, standard distributions and sample tests of significance, correlation and regression, elementary ideas of sampling.

(ii) Applied aspects of statistical methods.

These include measures of fertility; mortality and morbidity, indices of efficiency of working of health institutions, statistical methods in health planning, manpower studies, special measurements in evaluation of health programmes, study designs specially applicable in health, e.g. clinical trials, evaluation, follow-up studies and longitudinal studies.

(4) Statistics in thesis preparation

**Research in Administration—Methodology**

**The Scientific Method**

Use of scientific method in research in community health administration. Development of methodology for research on community health programmes. Problems of quantification in research in community health administration and organization. Methods of evaluation. Preparation of protocols for research projects. Designs for research projects. Preparation of questionnaires etc.

Advanced statistical methods including (i) survey techniques; (ii) attitude measurements; (iii) systems analysis; (iv) community diagnosis; (v) statistical quality control charts for epidemic analysis; (vi) life table techniques; (vii) time series analysis; (viii) critical path analysis (PEPT); (ix) time and motion study; (x) queuing theory; (xi) work measurement and substitutability; (xii) cost-benefit and cost-effectiveness; (xiii) mathematical models for operational research; (xiv) linear programming; (xv) application of econometrics to the study of health economics.

**(II) M.D. (P. & S.M.)—A.I.I.M.S., New Delhi-16.**

**Biostatistics :**

(i) *Details of topics of health statistics.* Introduction ; Role of statistics in public health; Collection of data; The population census; Sampling in public health statistical classification of health data; Handling and processing statistical information; Analysis of demographic data; Measurement of mortality and fertility; Standardisation of rates and standard indices; Measurement of morbidity; Life table; How to measure health; Trends in morbidity; Health surveys; Evaluation in public health.

(ii) *Principles with some special application of descriptive statistics.* Introduction to bio-statistics—Aim and scope; Collection of data-

basic ideas; Presentation of data-tabulation, diagrams and groups  
 Measures of central tendency and dispersion; Place of normal distribution in statistics; Elementary idea of skewness and kurtosis  
 Concepts of correlation and regression.

*Statistical inference.* Elementary ideas of probability; Elements of sampling-what happens when sampling is resorted to.

Test of significance—C-R,  $X^2$ , t, etc.

Basic ideas of testing hypotheses.

Some special topics in Biostatistics:

Clinical trials-aim and scope-general principles, use of controls, placebos and dummies, final presentation of results-discussion of some well known clinical trials.

Prophylactic trials-assessment by time trends and geographical comparisons controlled prophylactic trials.

Retrospective and prospective studies, and follow up studies.

Field studies, prevalence surveys, guiding principles for data collection.  
 Control in field studies.

Control of hospital studies.

### (III) D.P.H.—Lucknow University.

Bio-Statistics (40 hours instruction)

The course is arranged in two parts :—

1. Vital Statistics, and
2. Statistical Methods.

(i) The course in vital statistics is designed to present :—

- (a) Methods of collecting vital statistics, census, registration and *ad hoc* enquiries.
- (b) Methods of tabulating and interpreting vital statistics, intercensal estimates of population, rates, standardization of rates, gross and net reproduction ratios, laws of mortality and life-tables.

- (c) Discussion of vital statistics a broad facts relating to demography, natality, morbidity and mortality.
  - (d) Laboratory practicals for putting into operation the methods presented in the lecture course.
  - (e) Demonstration in the field of methods of collection of vital statistics.
- (ii) The course in statistical methods deals with :—
- (a) Elementary exposition of topics like frequency curves, averages, standard deviation, normal curve, binomial and poison distributions, correlation, regression, simple curve fitting, sampling and tests of significance.
  - (b) Laboratory practicals for carrying out the fundamental statistical operations of importance in the public health work.

#### *IV. D.P.H.—University of Bombay (June, 1958).*

Statistical methods and vital statistics—80 hours.

#### Biometrics

1. The census—registration of births and deaths—registration of live births—registration of deaths—still births—registration of sickness.
2. Tabulation of data.
3. Construction of charts or graphs.
4. Population estimates—arithmetic, geometric, birth rate, death rate, IMR, specific death rates—proportional mortality, case mortality.
5. Standardised death rate—direct method, indirect method, occupational mortality.
6. Frequency distribution.
7. Averages, Mean, Median, Mode.
8. Measures of dispersion—range, M.D., S.D., S.D. of ungrouped series, S.D. of grouped series, co-efficient of variation.

9. Correlation—coefficient of correlation—correlation of un-grouped data or grouped data.
10. Co-efficients of regression.
11. Life-tables.
12. Sampling—sampling of attributes, sampling of variates.
  - (a) Binomial and poison distributions, correlation, regression, simple curve fitting.
  - (b) Lab. practicals for carrying out the fundamental statistical operations of importance in public health work.

*V. D.P.H.—Andhra University (1965).*

The course will consist of two parts :—

- (1) Vital statistics (2) Statistical methods.
- (1) The course in vital statistics is designed to present:
  - (a) Methods of collecting vital statistics—census, registration ad-hoc enquiries.
  - (b) Methods of tabulating and interpreting vital statistics. Incensal estimates of population rates, standardisation of rates, gross and net reproduction ratios, laws of mortality and table.
  - (c) Discussion of vital statistics, broad facts relating to demography, natality, morbidity and mortality.
  - (d) Demonstration in the field of method of collection of statistics.
2. The course in statistical methods deals with:
  - (a) Elementary exposition of topics like frequency curves, averages, S.D., normal curve, binomial and poison distributions, correlations, regressions, simple curve fitting and sampling.
  - (b) Preparation of sanitary reports.
  - (c) Study of annual reports of DGHS, New Delhi and Directors of Health Services of other States in India.

(VI) *Diploma in Child Health (D.C.H.)—Andhra University (1965).*

**Biostatistics :**

Their importance, compilation and how to calculate the means and S. Ds. as applied in research. How to write a medical essay.

(VII) *DPH—University of Rajasthan (1969)*

**Health Statistics**

Collection, modes of calculation and interpretation of health statistics—the census—calculation of population—various morbidity, mortality and natality rates etc.—elementary statistical methods—their application and interpretation. Life table-preparation of reports.

(VIII) *M.Sc. in Medical Biochemistry—University of Delhi (1964).*

Three hours paper on Biophysics and Biostatistics. Details not available.

(IX) *Diploma in Hospital Administration—University of Delhi (1964).*

A paper of 100 marks in Biostatistics and medical records. Details not available.

(X) *M.D. (P. & S.M.) M. S.—University of Baroda (1966).*

A paper on statistical methods and vital statistics. Details not available.

(XI) *Master of Engineering (P.H.)—A.I.I.H. & P.H., Calcutta (1968).*

**Statistics**

Fundamental procedures for the collection; tabulation and presentations of data; vital statistics; rates and ratios; statistical parameters; correlation in hydrology; population estimates.

(XII) *Diploma in Dietetics—A.I.I.H. & P.H., Calcutta (1968)*

Calculation of the nutritional value of foods from the table of food value and planning of menus.

**Economics :**

Elementary principles; influence of income on structure of diets; making best use of the money spent on food in lower income groups.

(XIII) *Diploma in Nutrition—A.I.I.H. & P.H., Calcutta (1968).*

### Statistics

Principles of statistics; sampling for dietary and nutritional surveys interpretation of results.

(XIV) *Diploma in Public Health—A.I.I.H. & P.H., Calcutta (1968).*

### Medical Statistics

Collection, modes of calculation and the interpretation of medical statistics the census—estimation of population, calculation of birth rate death rates, marriage rates, infant mortality rates, etc., elementary statistical methods—their application and interpretation—life table—preparation of sanitary reports—study of the annual reports of the Director General of Health Services and Directors of Health Services in India—methods of epidemiological investigation.

(XV) *Diploma in Health Education— A.I.I.H. & P.H., Calcutta (1968).*

### Statistics

Introduction to health statistics—courses of health statistics—classification of health data and tabulation—graphic presentation—percentages and ratios—averages—measures of dispersion—elementary notions sampling—probability—standard distributions—sample surveys—the chi square distribution—t-distribution—standardisation of vital rates—life tables—role of education in promoting registration—use of statistics in education aspect of programme.

(XVI) *Certificate in Preventive and Social Medicine (Teachers of A.I.I.H. & P.H., Calcutta (1968).*

### Statistics

Demography—biology of population—growth and decline—relations of demographic characteristics to social and economic factors—socio-medical problems arising from excessive population increase—population control

(XVII) *Certificate in Public Health Engineering—A. I. I. H. & P. H., Calcutta (1968).*

### Statistics

General statistics, mean, standard deviation, rates etc.

(XVIII) *Certificate in Public Health Engineering-A.I.I.H. & P.H., Calcutta (1968).*

### Statistics

Statistics and vital statistics, their origin, uses and importance. Collection of vital statistics, methods used in India and other countries. Role of public health nurse in the collection and improvement of vital statistics. Compilation, tabulation and presentation of vital statistics information. Definition—infant mortality rate, maternal mortality rate, morbidity rate, death rate, birth rate, prenatal death, stillbirth, etc.

Laboratory work, calculation of common rates and ratio, preparation of tables, diagrams, charts, etc.

(XIX) *Job Orientation Training Course in Family Planning-A. I. I. H. & P.H., Calcutta (1968).*

### Demography

Nature and development of population study—measurement of fertility—study of mortality, marriage and migration pattern—application of demography knowledge in family planning programme—application of statistical methods in family planning demographic studies.

## **APPENDIX I**

### **Seminar on Teaching of Biostatistics in Medical Colleges**

#### **Programme**

15.6.1970 Monday	0830-0900	Registration	
	0900-1015	Introduction, Objectives and Methodology of the Seminar	Dr. T. R. Tewari (Director, NIHAEC)
	1015-1030	Formation of Work Group & Methodology of Group Work	Shri H. R. Sharma (Chairman: Dr. T. R. Tewari)
	1100-1230	Review of the existing course contents for undergraduates in Medical Colleges in India	Shri H.R. Sharma
	1230-1330	Work Group I; 1st session general discussion on the terms of reference	
16.6.1970 Tuesday	0830-1000	Statistical contents of Medical Courses in other Countries	Dr. R. Padley (Chairman: Dr. T. R. Tewari)
	1000-1015	Coffee Break	
	1015-1145	Place of statistics in medical curriculum. Recommendations of the Medical Council of India & other agencies like the Royal Commission on Medical Education U.K., Assessment	Shri H.R. Sharma

Committee of the C.C.H.  
etc. and WHO.

	1200-1330	Work Group I, 2nd Session	
17.6.1970 Wednesday	0830-1000	Statistics for post graduate	Panel discussion by participants (Chairman : Dr. K. V. Ramachandran)
	1000-1015	Coffee Break	
	1015-1145	Work Group I, 3rd session	
	1200-1330	Work Group I, 4th Session	
18.6.1970 Thursday	0830-1000	Teaching of Statistics in Staff College of NIHAE	Shri H. R. Sharma
	1000-1015	Coffee Break	
	1015-1145	Work Group I, 5th Session	
	1200-1330	Work Group I, 6th Session	
19.6.1970 Friday	0830-1000	Work Group I, 7th Session	
	1000-1015	Coffee Break.	
	1015-1145	Work Group II, 1st Session (discussion on terms of reference and procedure, etc.)	
	1200-1330	Work Group II, 2nd Session	
20.6.1970 Saturday	0830-1000	Methods of teaching	Dr. Uday Pareek and Shri T.V. Rao

	1000-1015	Coffee Break
	1015-1145	Didactic lectures as a method of teaching
	1200-1330	Work Group II, 3rd Session
21.6.1970 Sunday		HOLIDAY
22.6.1970 Monday	1000-1145	Plenary session-Work Group Reports (Chairman: Dr. T. R. Tewari)
	1200-1330	Work Group III
23.6.1970 Tuesday	0830-1000	Tutorial Groups as a method of teaching Dr. J. Servenka WHO Consultant
	1000-1015	Coffee Break
	1015-1145	Teaching round a problem Dr. Ramachandran
	1200-1330	Work Group II, 4th Session
24.6.1970 Wednesday	0830-1000	Seminar as a method of teaching statistics Dr. J. Servenka WHO Consultant
	1000-1015	Coffee Break
	1015-1145	Programmed Instruction Dr. Misra
	1200-1330	Work Group II, 5th Session
25.6.1970 Thursday	0830-1000	Work Group II, 6th Session
	1000-1015	Coffee Break
	1015-1145	Work Goup II, 7th Session

	1200-1330	Work Group II, 8th Session
26.6.1970 Friday	0830-1000	Open Session
	1000-1015	Coffee Break
	1015-1330	Plenary Session-Group Reports (Chairman: Dr. T.R. Tewari)
27.6.1970 Saturday	0900-1230	Final Report and Concluding Session (Chairman: Dr. T.R. Tewari).

**APPENDIX**

**List of participants who attended the Seminar on Biostatistics  
in Medical Colleges (June 15-27, 1970)**

<i>State/Organisation</i>	<i>S. No.</i>	<i>Name</i>	<i>Designation</i>
<b>Andhra Pradesh</b>			
	1.	Dr. I. L. Narsaiah	Prof. of Social and Preventive Medicine, Kurnool (A.P.)
	2.	Mr. P.S.R. Harnath	Lecturer in Statistics, Osmania Medical College, Hyderabad.
<b>Gujarat</b>			
	3.	Miss Pratiksha Jyotish Dhru	Jr. Lecturer in Biostatistics, N.H.L. Municipal Medical College, Ahmedabad.
	4.	Dr. B.K. Mahajan	Prof. of P. & S. M., M. P. S. Medical College, Jamnagar (Gujarat)
	5.	Mr. S.D. Telwala	Statistician, Govt. Medical College, Surat
<b>Haryana</b>			
	6.	Mr. B.K. Jain	Statistician, State Family Planning Training Centre, Rohtak.
<b>J. &amp; K.</b>			
	7.	Mr. S.K. Bhat	Statistician, Medical College, Srinagar.

<i>State/Organisation</i>	<i>S. No.</i>	<i>Name</i>	<i>Designation</i>
<b>Maharashtra</b>			
	8.	Mr. R.D. Majumdar	Statistician, Govt. Medical College, Nagpur.
	9.	Mrs. K.D. Lothikar	Biostatistician, G. S. Medical Col- lege, Bombay.
	10.	Mr. S. D. Ghanekar	Biostatistician, T. N. Medical College, Bombay.
<b>Mysore</b>			
	11.	Mr. B. S. Srinivasan	Lecturer in Statistics, Medical College, Mysore.
<b>Madhya Pradesh</b>			
	12.	Dr. M. C. Mittal	Prof. and Head of Dept. of P & S.M., M. G. M. Medical College, Indore.
<b>Rajasthan</b>			
	13.	Mr. S. P. Mathur	Statistician, S.M.S. Medical College, Jaipur.
<b>Uttar Pradesh</b>			
	14.	Mr. P.C. Jain	Statistician-cum- Reader, Deptt. of P. & S. M., K. G. Medical College, Lucknow.

<i>State/Organisation</i>	<i>S. No.</i>	<i>Name</i>	<i>Designation</i>
	15.	Mr. N.S.N. Rao	Statistician, College of Medical Sciences, Banaras Hindu University, Varanasi

### CONSULTANTS

Dr. J. Servenka, WHO Consultant

Dr. R. Padley, WHO Consultant

Dr. K.V. Ramachandran, DTRC, Bombay.

## FACULTY, 1970

Dr. T.R. Tewari  
Dr. V. Binimelis  
Dr. A. Bujevic

Director  
WHO Consultant  
WHO Consultant

### Professors

Dr. S.K. Rao

Public Health Administration and  
Dean of Studies  
Programme Evaluation  
Hospital Administration  
Social Sciences  
Epidemiology  
Health Extension and Education

### Associate Professors

Dr. N.V. Raghuram  
Dr. (Mrs.) Prabha Malhotra  
Dr. D. Banerji  
Mrs. Achamma Thomas

Public Administration  
M.C.H. & Family Planning  
Field Training  
Public Health Nursing

### Assistant Professors

Shri T.J. Ramaiah  
Dr. T.R. Anand  
Dr. J.P. Gupta  
Shri S.R. Mehta  
Dr. (Mrs.) Rita Sapru  
Shri T.V. Rao  
Miss. M.R. Rele

Statistics  
Public Health Administration  
Field Training  
Social Sciences  
M.C.H. & Family Planning  
Education and Training  
Statistics

### Assistant Editor

Shri Greesh Mathur

### Administrative Officer

Shri V.P. Pandit

